60 STORIES OF STEEL

BETHLEHEM'S ROLE IN FABRICATING AND ERECTING 53,000 TONS OF STEELWORK FOR THE CHASE MANHATTAN BANK BUILDING IN NEW YORK CITY

BETHLEHEM STEEL

A NEW COLOSSUS FOR LOWER MANHATTAN

Who would not marvel at this scene?

To the traveler from abroad it tells of the might, the wealth, the creative urge of the New World.

To all Americans it says, "Behold the greatness of our land. Behold our greatest city."

These towers, born of wealth and dreams, are

shaped with steel—for it takes steel's sinewy strength to thrust high, floor on floor, to scrape the very sky.

The modern skyscraper became a practical reality when, in 1907, Bethlehem Steel Company rolled the nation's first wide-flange structural shapes—long known as "Bethlehem beams." Down through the years, much of the steel for the nation's greatest structures, has come from Bethlehem's furnaces and mills.

Now a new colossus reigns on the famed skyline. It is The Chase Manhattan Bank Building, sixty stories tall, and five stories deep.

Here is the story . . .

IT ALL STARTED with The Chase Manhattan Bank's decision to construct a new general office building.

It had to be a big building (Chase Manhattan is the nation's second largest bank), and it had to be a distinguished one, reflecting the institution's great prestige.

It had to provide enough office space for some 9,000 employees housed in scattered locations throughout the area—a result of the formation of Chase Manhattan in 1955 through the merger of The Chase National Bank and The Bank of the Manhattan Company.

And, since bankers are businessmen, it ought to have prime office space left over for rental to blue-chip tenants.

But where to locate the new building? Would Chase Manhattan "bank" on the teeming financial district, an area some say is on the decline? Would they invest millions in a large parcel of perhaps the world's most costly real estate? Real estate, furthermore, that required deep digging to bedrock, bringing total land and site preparation costs to a whopping $17 million!

The story broke in November, 1957. The bank announced a project that startled many for its sheer boldness and magnitude. It delighted many more for its public-spiritedness. Certainly it was evident that a philosophy of "let's build something the city can be proud of" pervaded the planning councils.

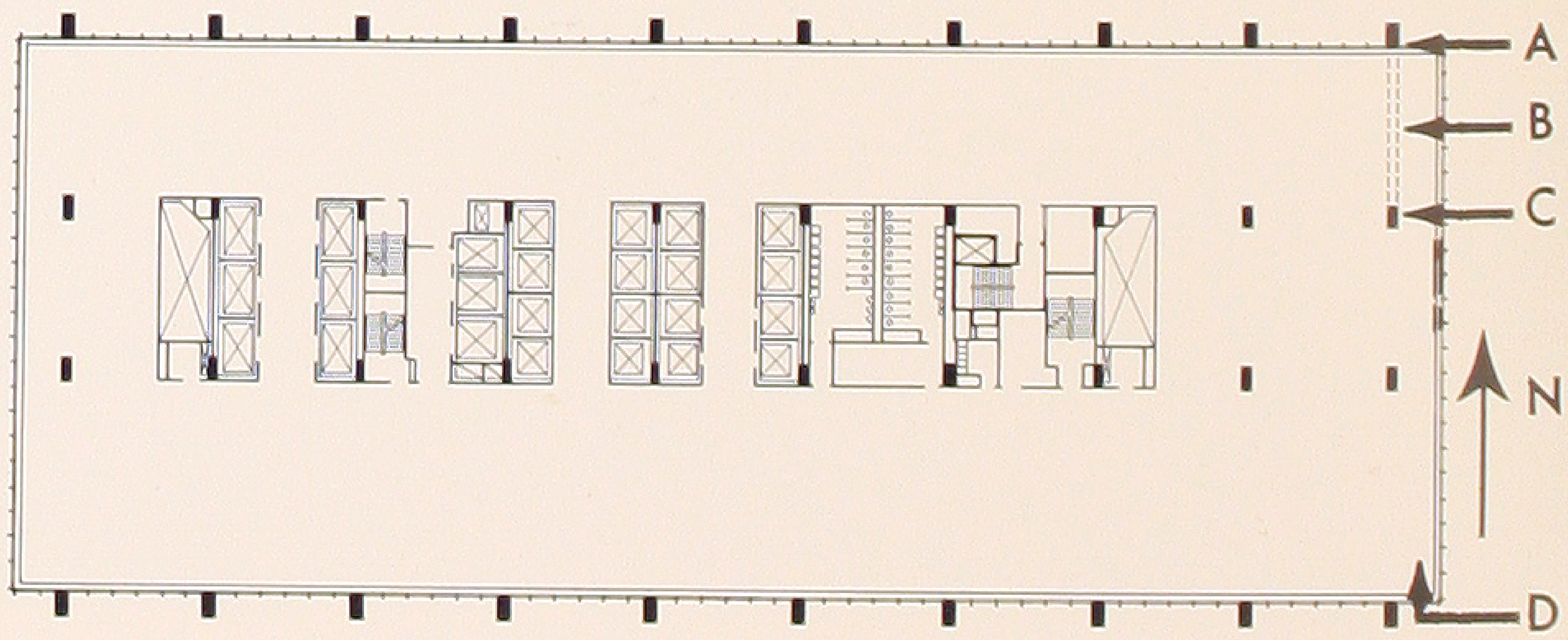
Unlike most financial district behemoths, Chase Manhattan's building does not crowd the lot lines, rising from the sidewalk's very edge, saying "I own this property, and by Jupiter I'll use every inch of it."

The Chase Manhattan Bank Building occupies less than a third of its 2½-acre site. It sets back from the city streets on all four sides. On one side, to the south, it overlooks a landscaped plaza, a delightful sunlit area in a neighborhood of deep shadows.

As these words are written, there's much to be done before the building is formally dedicated and opened for occupancy. But the basic structure is up. Its steel frame is complete, now sheathed in gleaming metal and sparkling glass. It is already one of the city's distinctive landmarks.

The Chase Manhattan Building, rooted 90 ft below street level and soaring 813 ft into the air, derives its great strength from a frame of structural steel—53,000 tons of steel, a total exceeded by few buildings ever constructed. The contract to supply the steel, to fabricate the massive beams and columns, and to erect it, was awarded to Bethlehem Steel Company, builder of many of New York City's most prominent structures.

Literally acres of blueprints were delivered to Bethlehem's Fabricated Steel Division. There, erection specialists spent hundreds of hours evolving plans and procedures for erecting the steelwork. Simultaneously, engineers and draftsmen prepared shop drawings, showing precisely how every individual beam and plate had to be cut and fitted, every hole drilled, every rivet driven. At our Pottstown Fabricating Works, operating men contrived ingenious methods of handling the exceptionally large steel assemblies.



The framing plan of the office floors calls for all peripheral columns (A) to be located *outside* the building's exterior walls. Wind girders (B) extend from the outer row of columns to the core columns (C), leaving a completely open area measuring 40 ft by 280 ft along the south side, and 30 ft by 280 ft along the north. Floors are cantilevered 10 ft beyond the column line to the east and west (D).

Meanwhile, at the jobsite (a solid city block bounded by Nassau, Liberty, William and Pine Streets), the existing buildings had been demolished and foundation contractors were already at work.

The full story behind the unique scheme devised for the foundation work is beyond the scope of this booklet. It is sufficient to say that the problem of excavating to a depth of 90 ft to bedrock, removing some 40,000 tons of sand, hardpan, and Manhattan schist, required the utmost care and intelligent planning.

There were such obstacles as the foundations of old buildings and myriad gas, water, and electric lines passing through the property. Ground water had to be controlled at all times; constant safeguards had to be observed to prevent cave-ins. At some points, where watery sand was found between hardpan and bedrock, chemicals were used to stabilize the soil. A subcontractor, Chemical Soil Solidification Company, injected chemical grout that transformed the unstable sand into an impervious substance, enabling normal excavation to proceed.

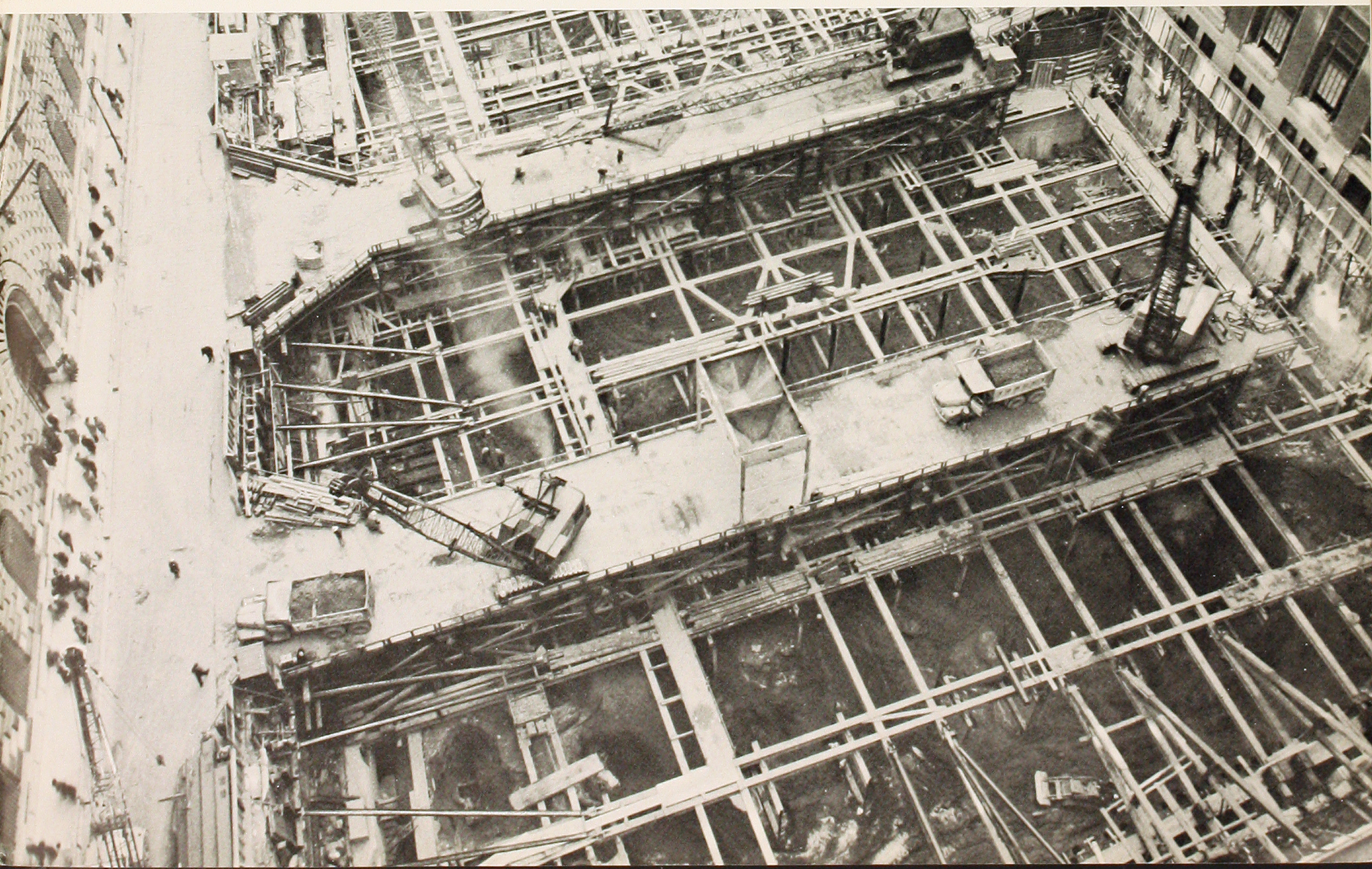
The method chosen is known as the "open cofferdam"—a method far less hazardous than "sandhogging," or digging under pressure.

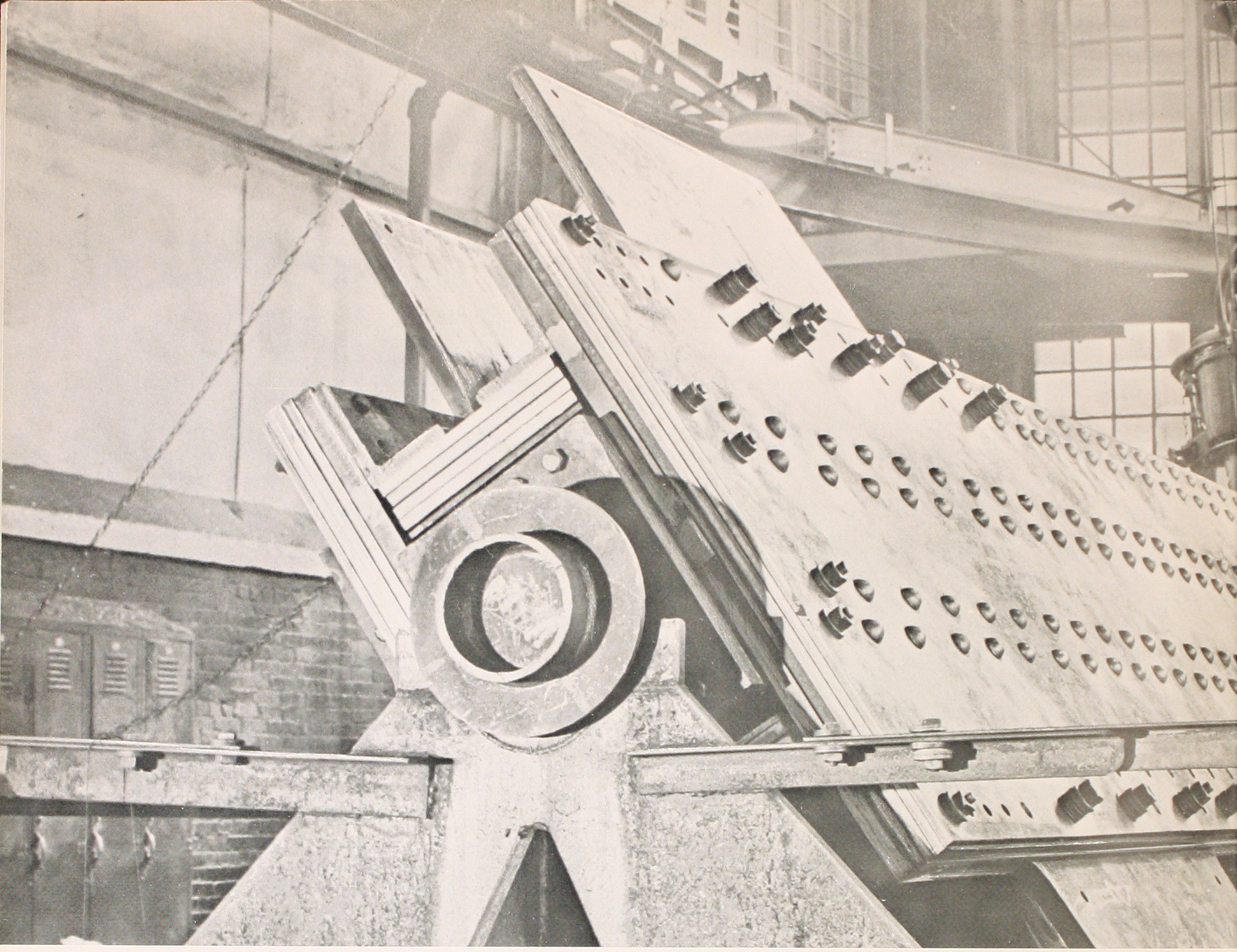
In its simplest form, the cofferdam method means that "walls" (consisting of interlocking steel sheet piling) are driven into the earth. This forms a sort of open-ended box, whose walls prevent cave-ins while the earth is dug out. Then permanent reinforced-concrete retaining walls are constructed.

In this method, it's obvious that the deeper you dig inside the "box" (the cofferdam), the more bracing you need to prevent the surrounding earth from collapsing inward. Ordinarily this bracing is temporary—it's removed when permanent foundations are in. But in this case the outside pressures would require so much bracing that the entire pit would be cluttered with it, making foundation work almost impossible.

For this and other reasons, the consulting engineers devised a completely new process. They decided to let the building's permanent substructure (underground) steelwork brace the outer walls. By erecting the steel, then jacking the lines of floor beams outward, the floor system provided permanent horizontal bracing.

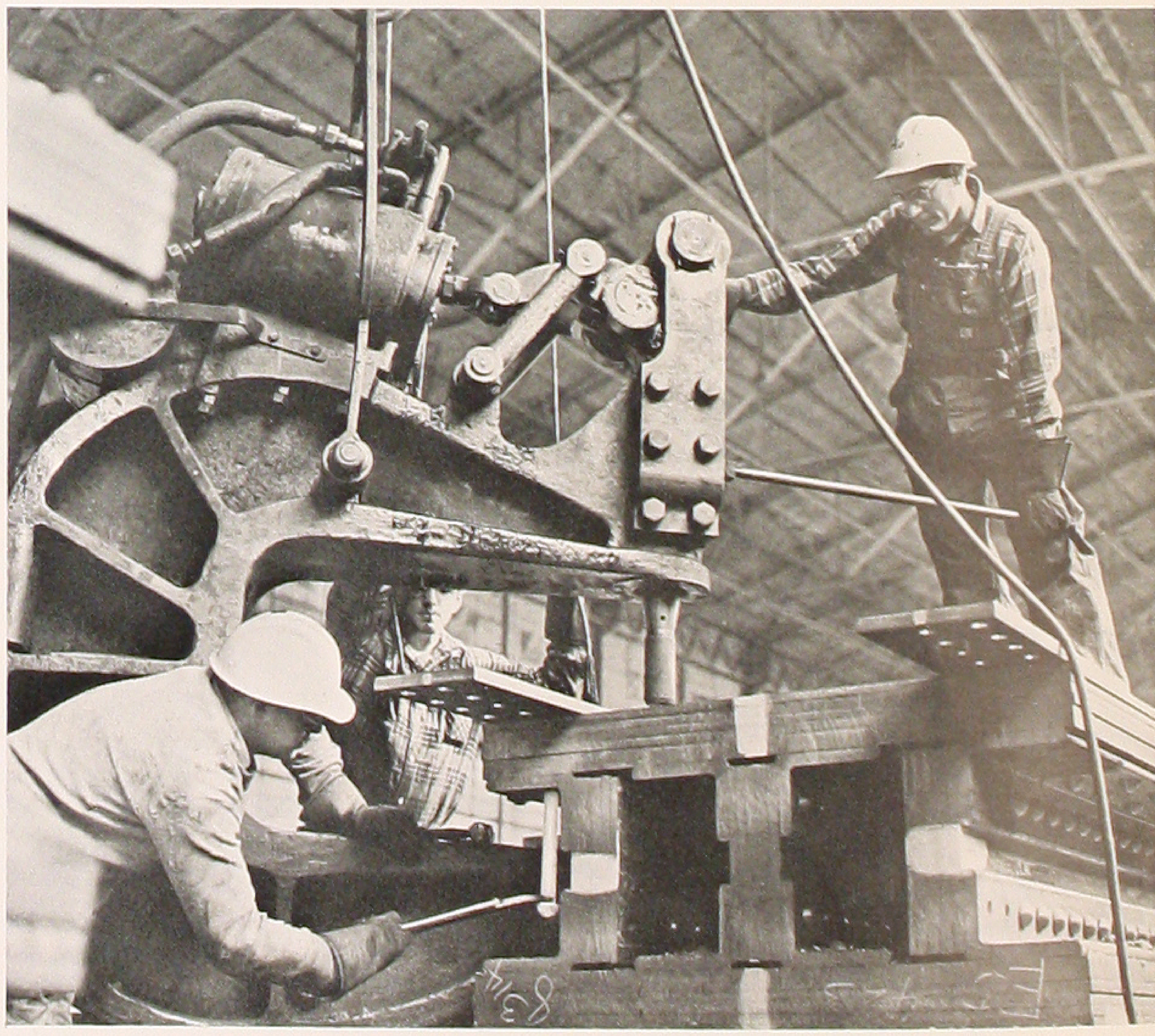
The construction site during the early stages. Bethlehem steel sheet piling was driven and concrete walls were poured. Then enough material was excavated to permit construction of the first level of basement steel. At points where walls of subways or the foundations of neighboring buildings bordered the excavation, temporary bracing was necessary. Steel was handled from three trestles, a most unusual procedure in construction of a building.



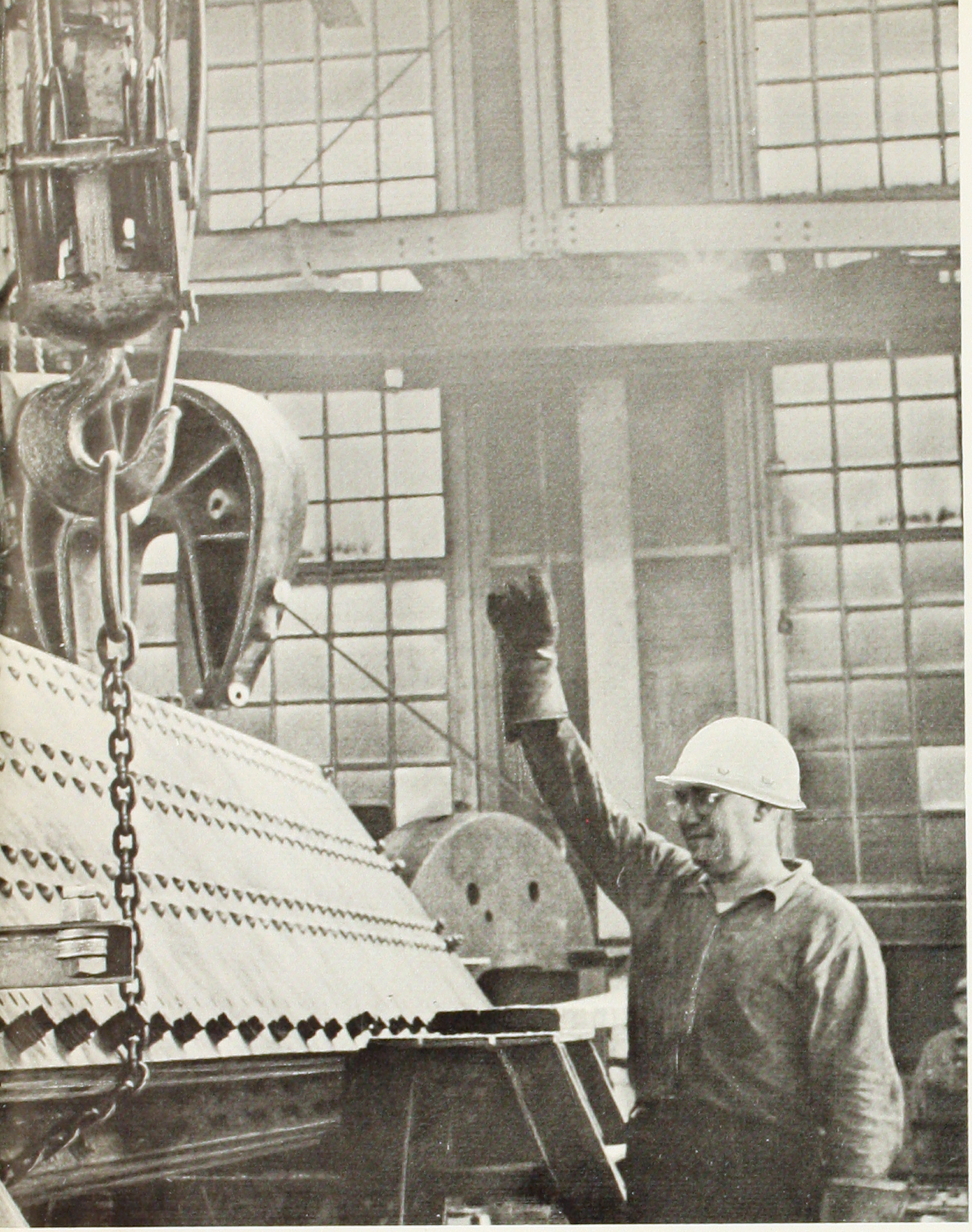


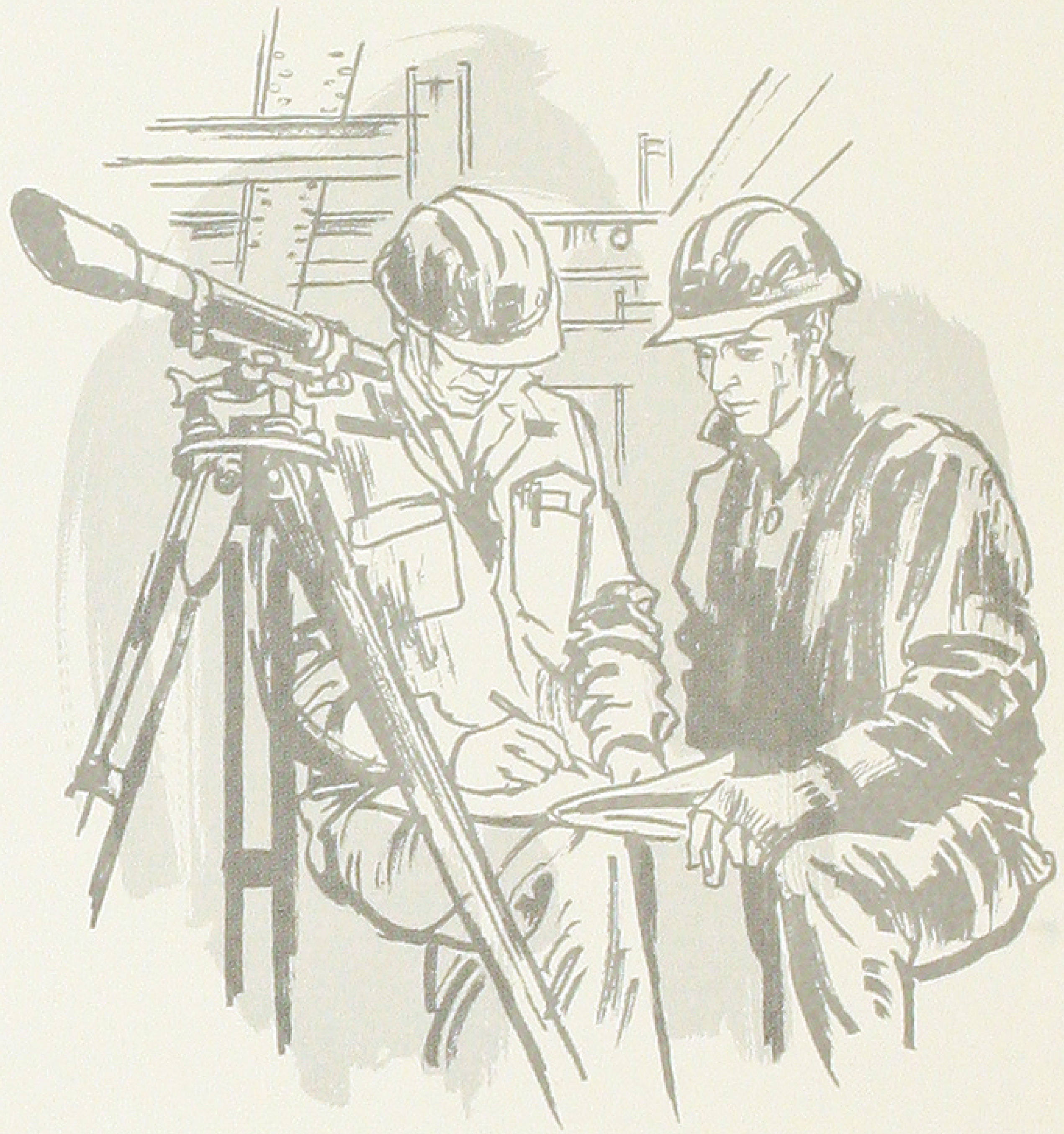
The design of this monumental building called for some of the biggest and most complex steel components ever used. Fabricating them posed problems even for our giant Pottstown Fabricating Works, near Philadelphia. One of the world's biggest fabricating facilities, it normally employs about 2,000 men. Steel for many of the nation's largest buildings and bridges was fabricated here.

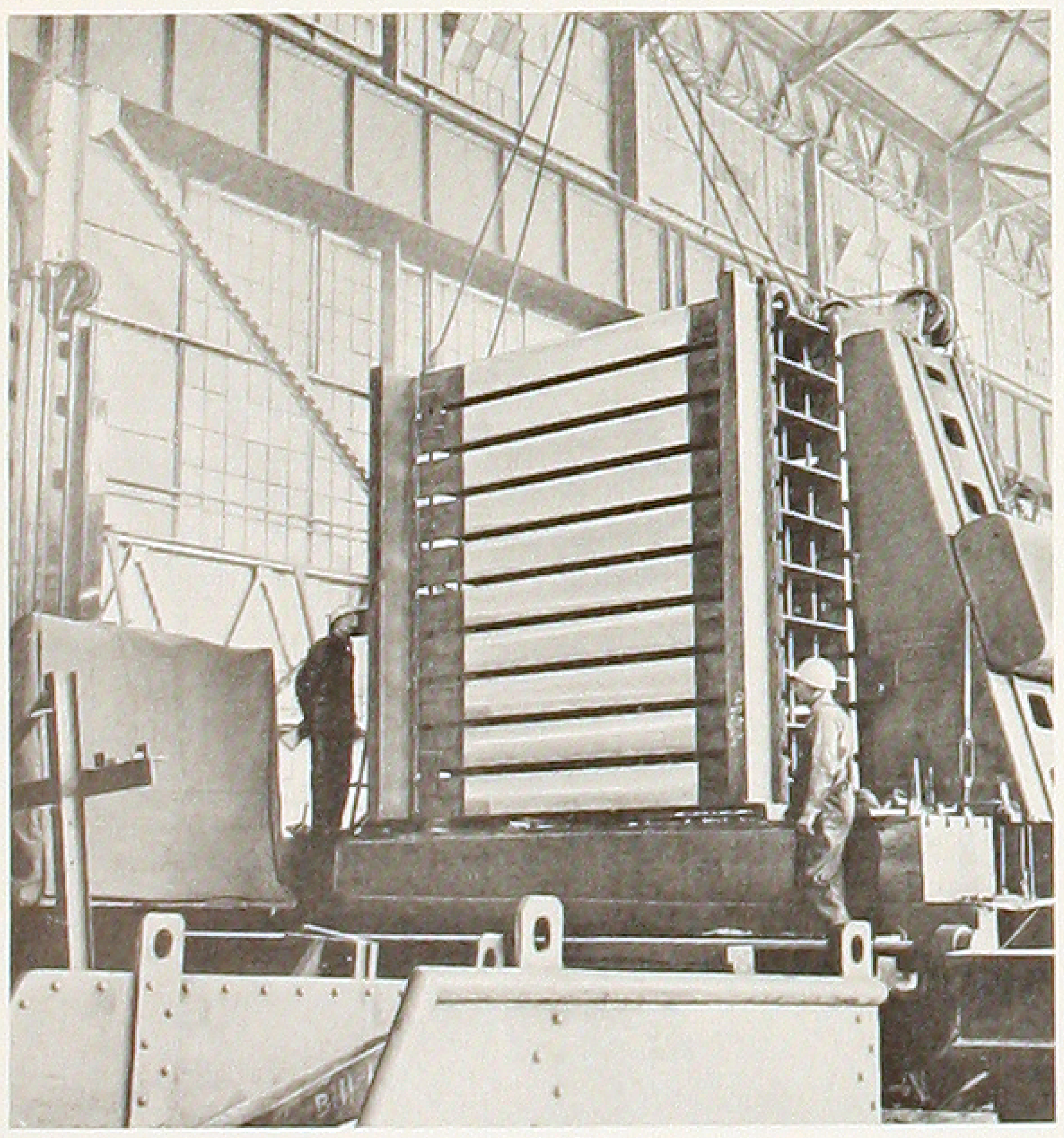
Special equipment and procedures were required to handle the ponderous column sections, some weighing 52 tons, and up to 36 ft long. The rig shown above permitted workers to rotate each section with the aid of small cranes, so as to position it properly for driving rivets. Approximately 550 rivets were required for every section. Total number of shop rivets used in the structure—2,929,603!



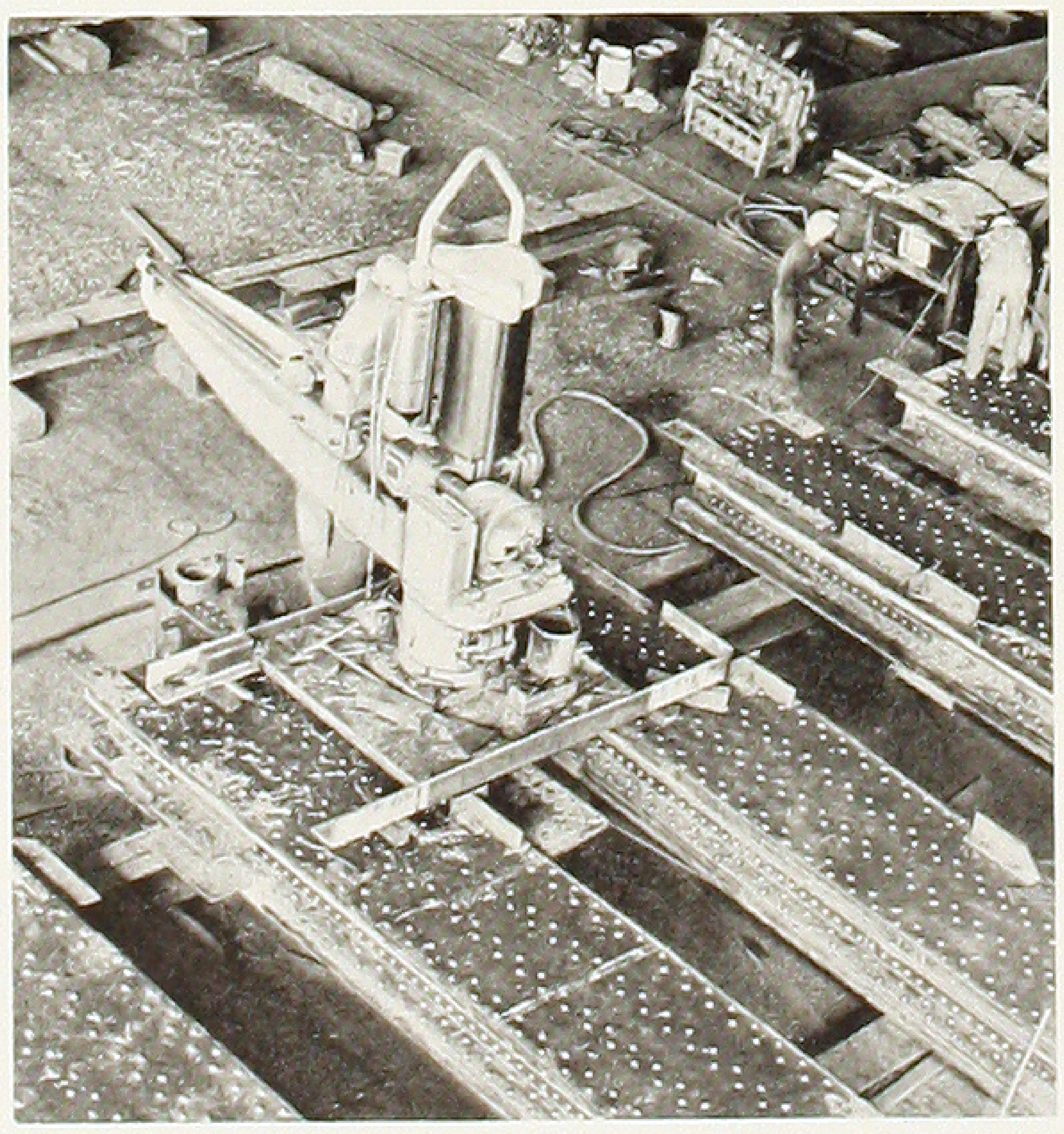
Machines were used to rivet splice plates to this column's 6-in.-thick flanges. Here a workman slips a glowing rivet into the hole where the machine quickly forms the head. Every rivet was later checked by eagle-eyed inspectors.



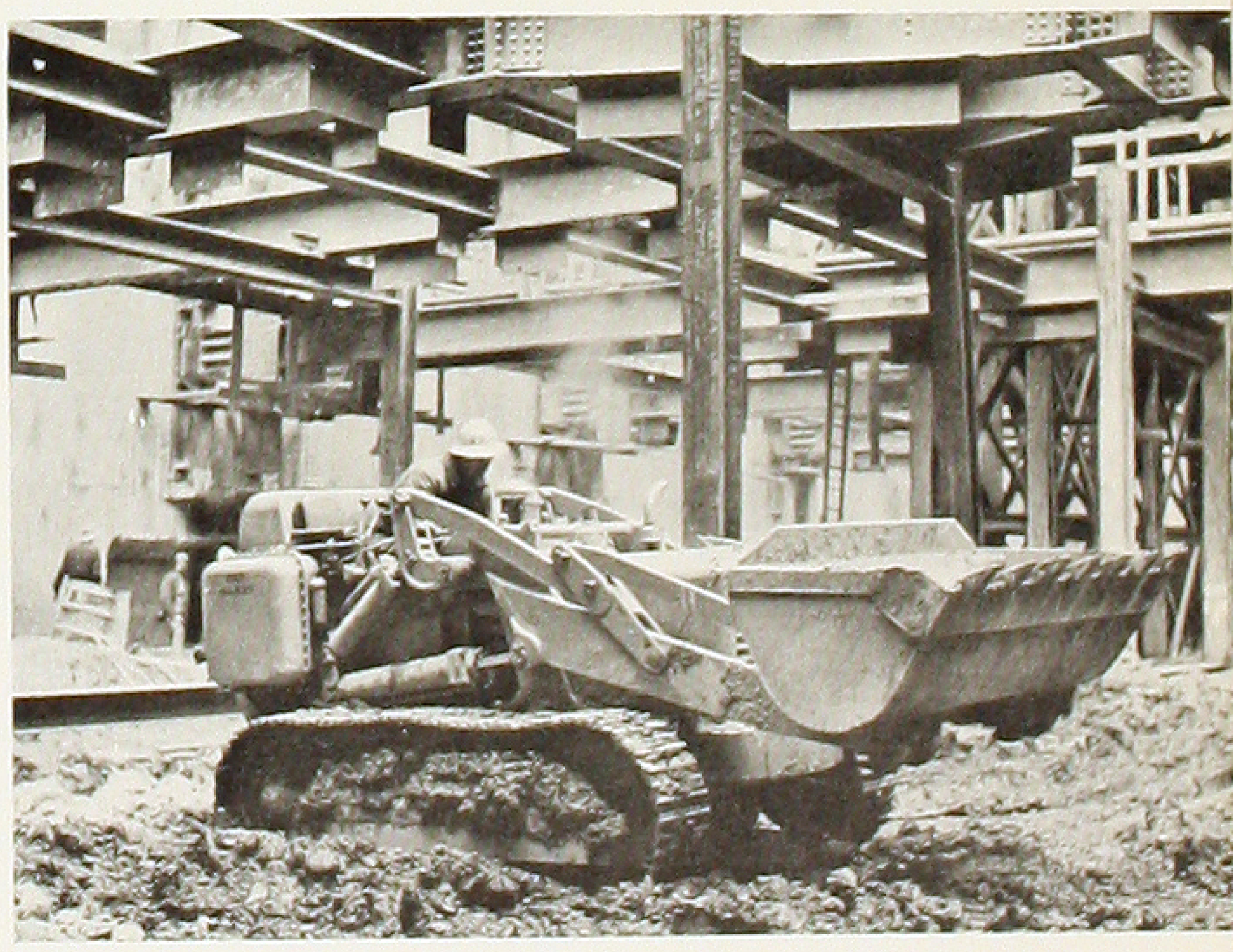




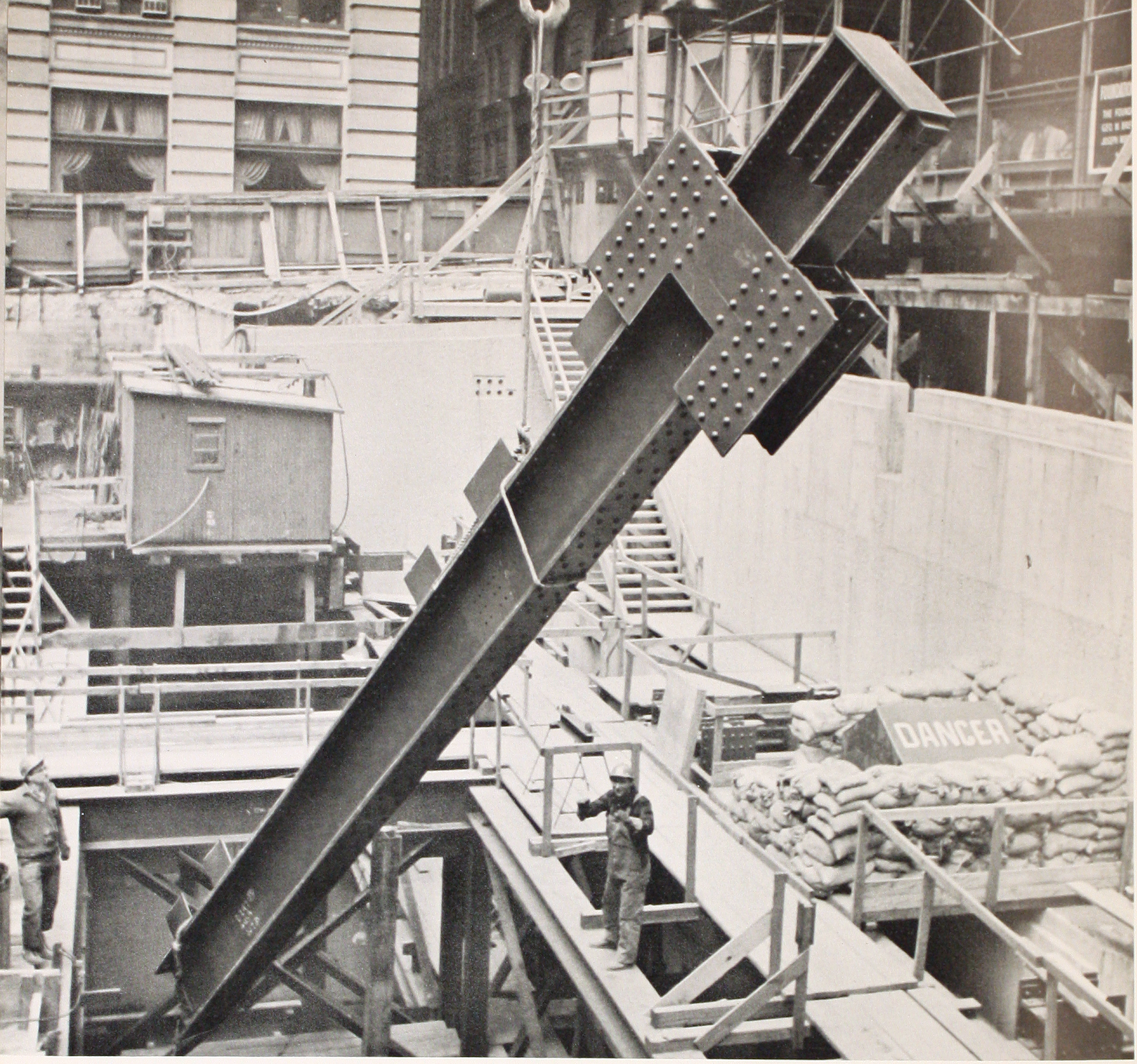
This is a grillage section, placed up on end for machining. The grillages are the bases from which the building's columns rise straight to its summit. Each is capable of supporting 7,000 tons.



Fully riveted, column sections were moved to a huge work bay where bolt holes were drilled in the protruding "wings"—plates for connecting girders to the columns.

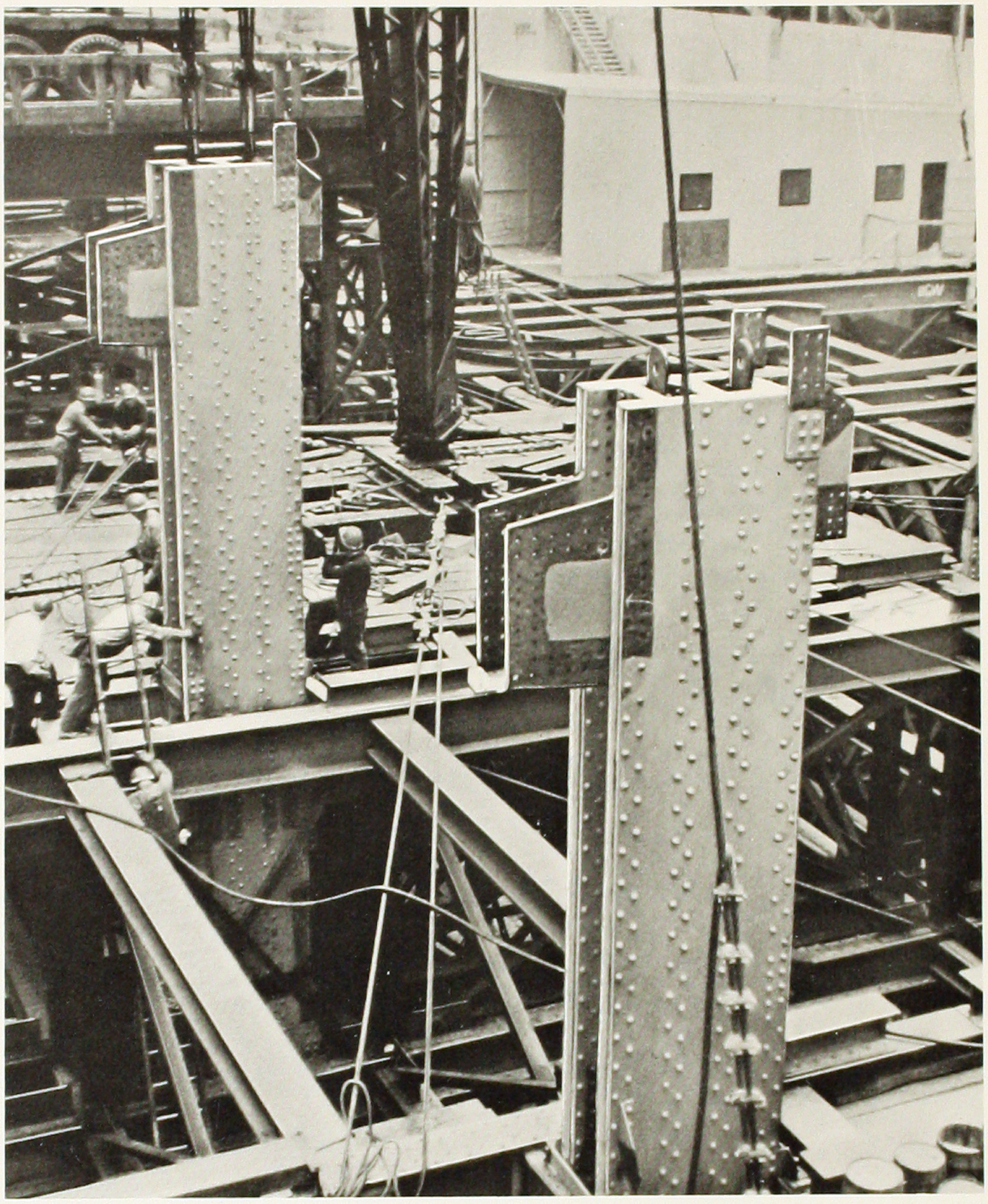


As steelwork for the substructure arrived in New York, Bethlehem's erection crews assembled the complex basement framing on top of temporary piling supports, or "bents." Several can be seen here. Later the load was transferred to the structure's permanent columns, and the piling was removed.

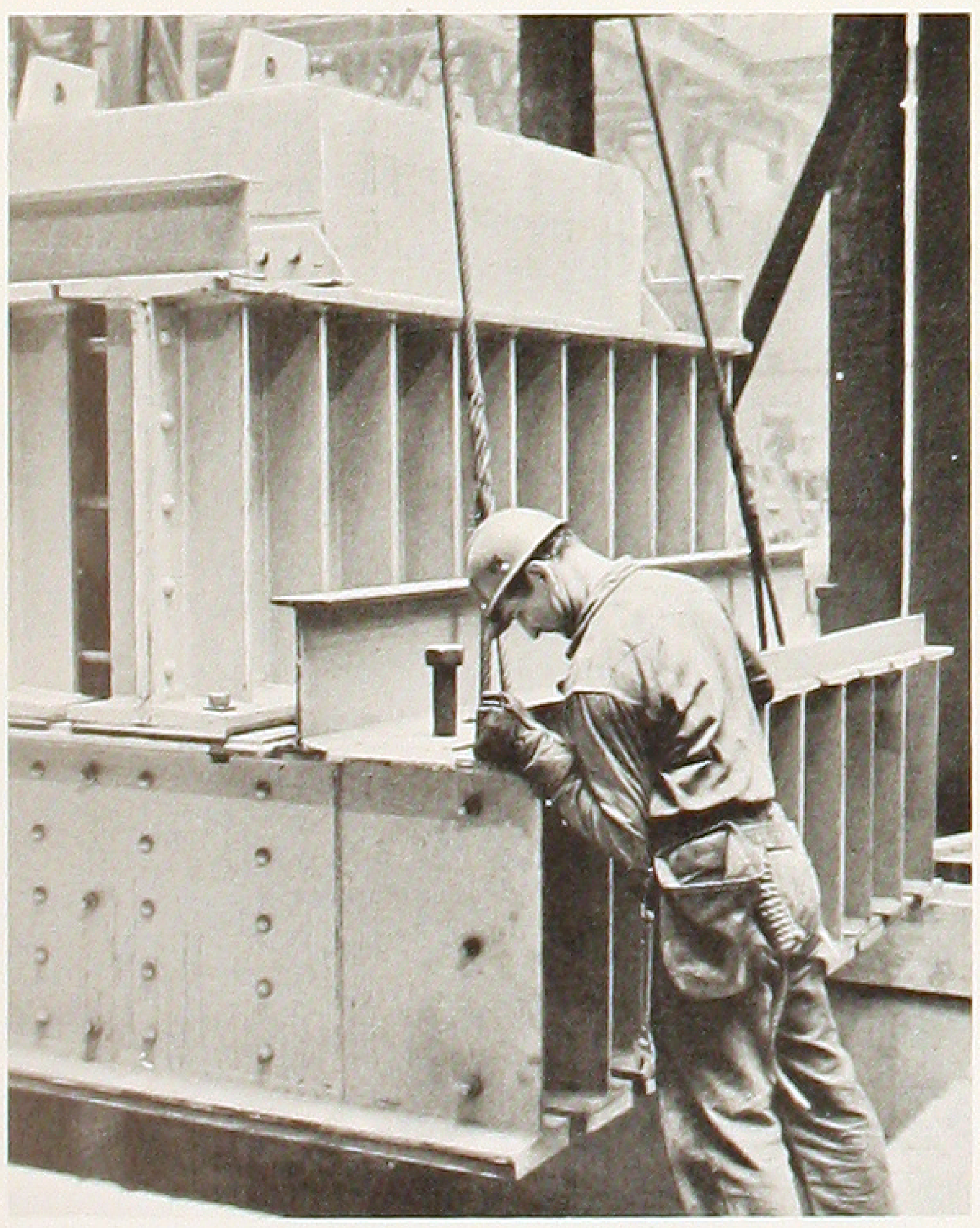


This is one of the permanent substructure floor beams which also function as part of the bracing system. Note the heavy brackets required for the jacking operation referred to on page 3.

Ironworkers man the derrick's "bull-stick" to maneuver the first column base—40½ tons of steel—into position to be lowered 100 ft to its foundation.

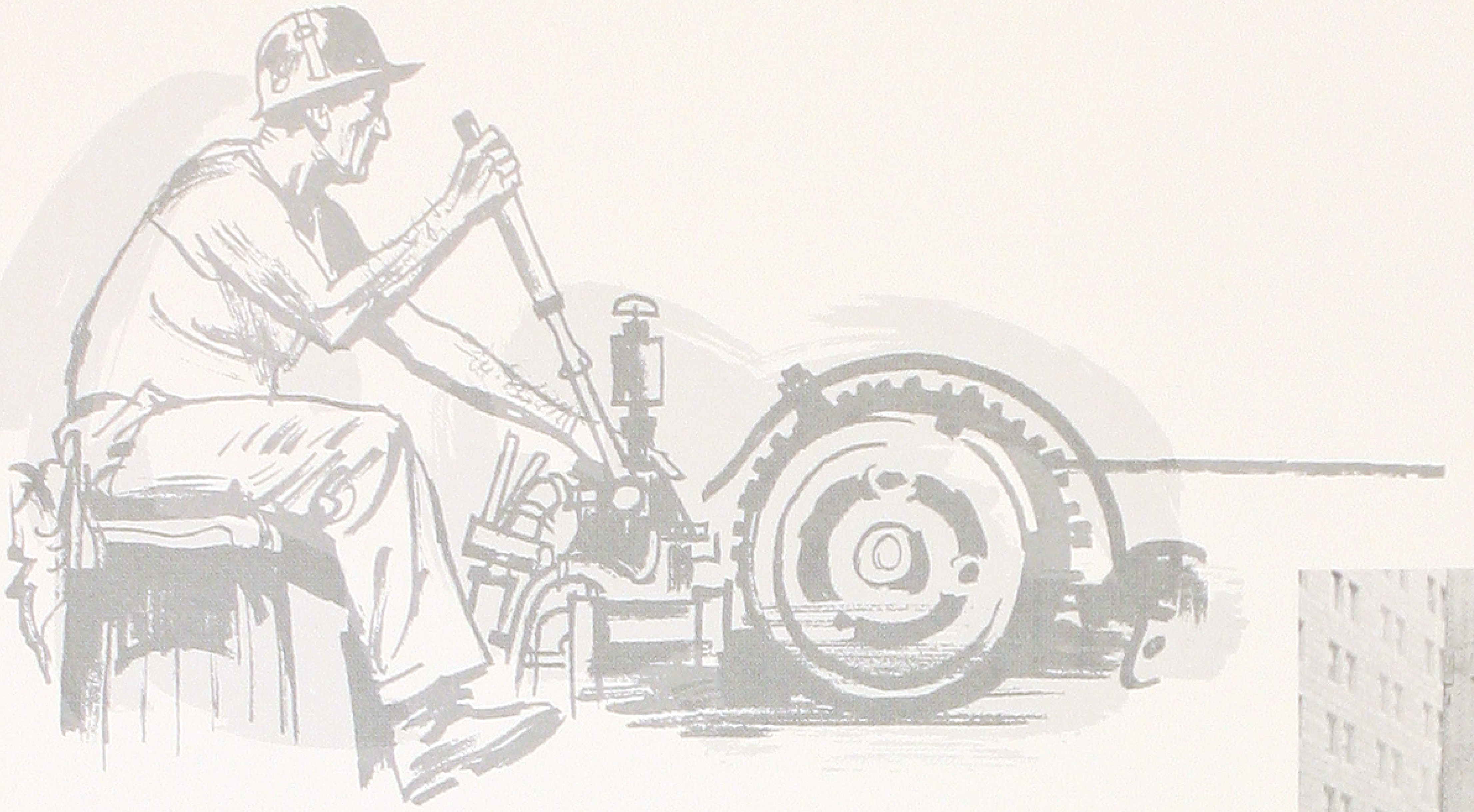


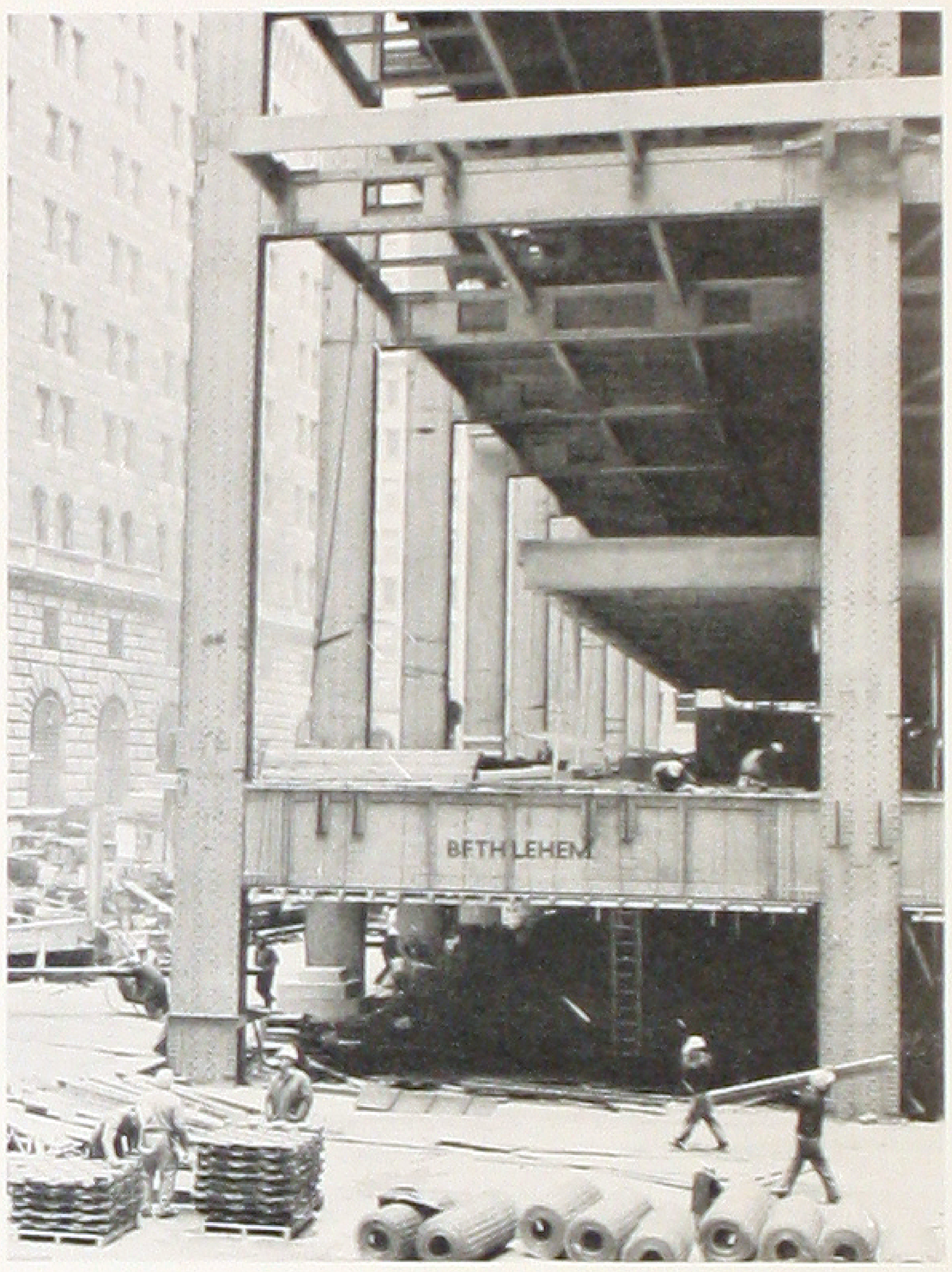
Columns seem to be growing out of the substructure as they are positioned in spaces provided in the substructure framing, then securely fastened in place. The protruding "wings" (for connecting girders) are integral extensions of the columns' cover plates.



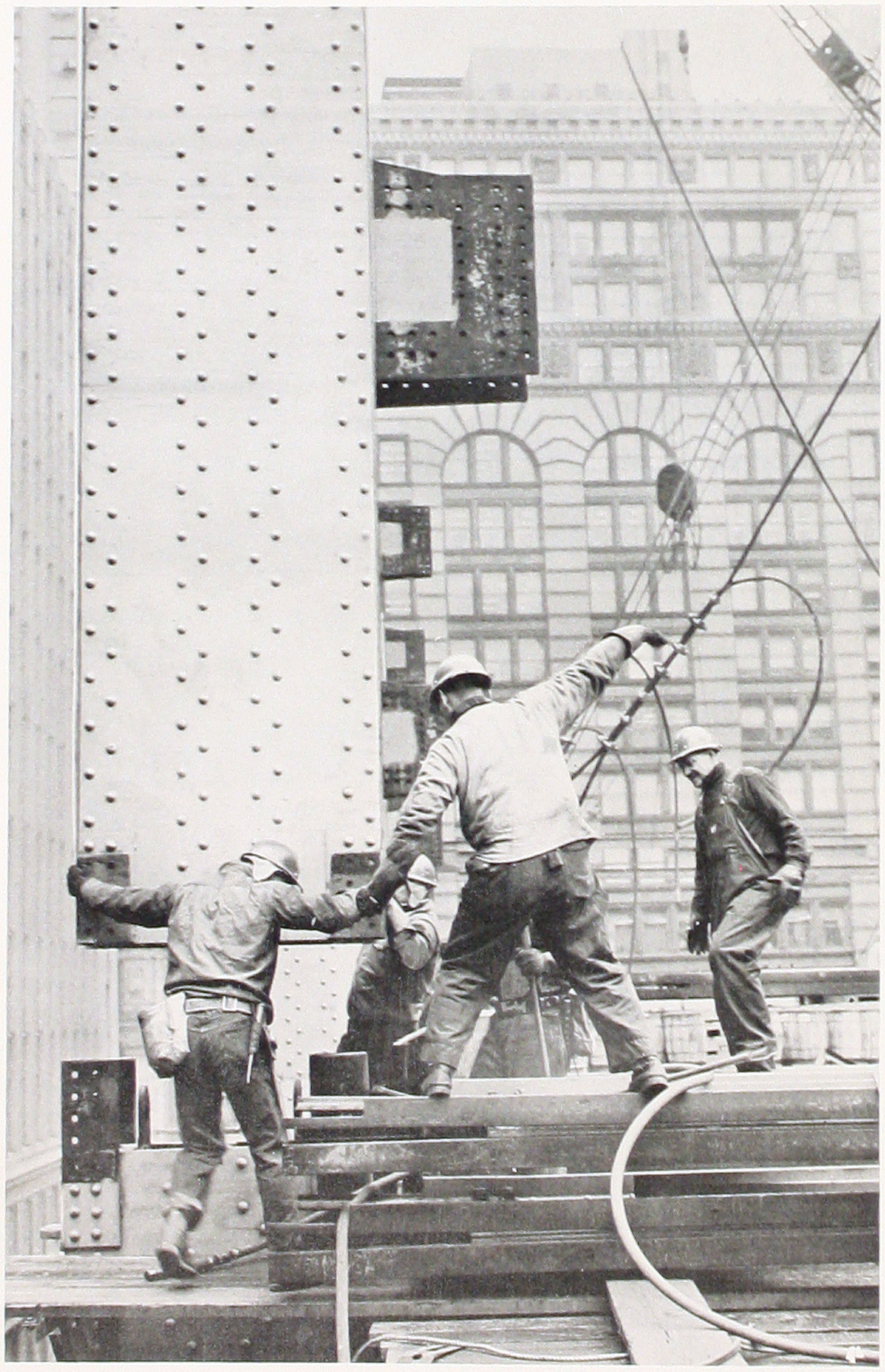
Slowly, carefully, a grillage is positioned over its foundation slab in a concrete pit. The columns rise straight up about 900 ft from these bases.

The columns start to rise. A bolting crew tightens the high-strength structural bolts connecting the first and second column sections. The bank's vaults will be located here, deep underground.



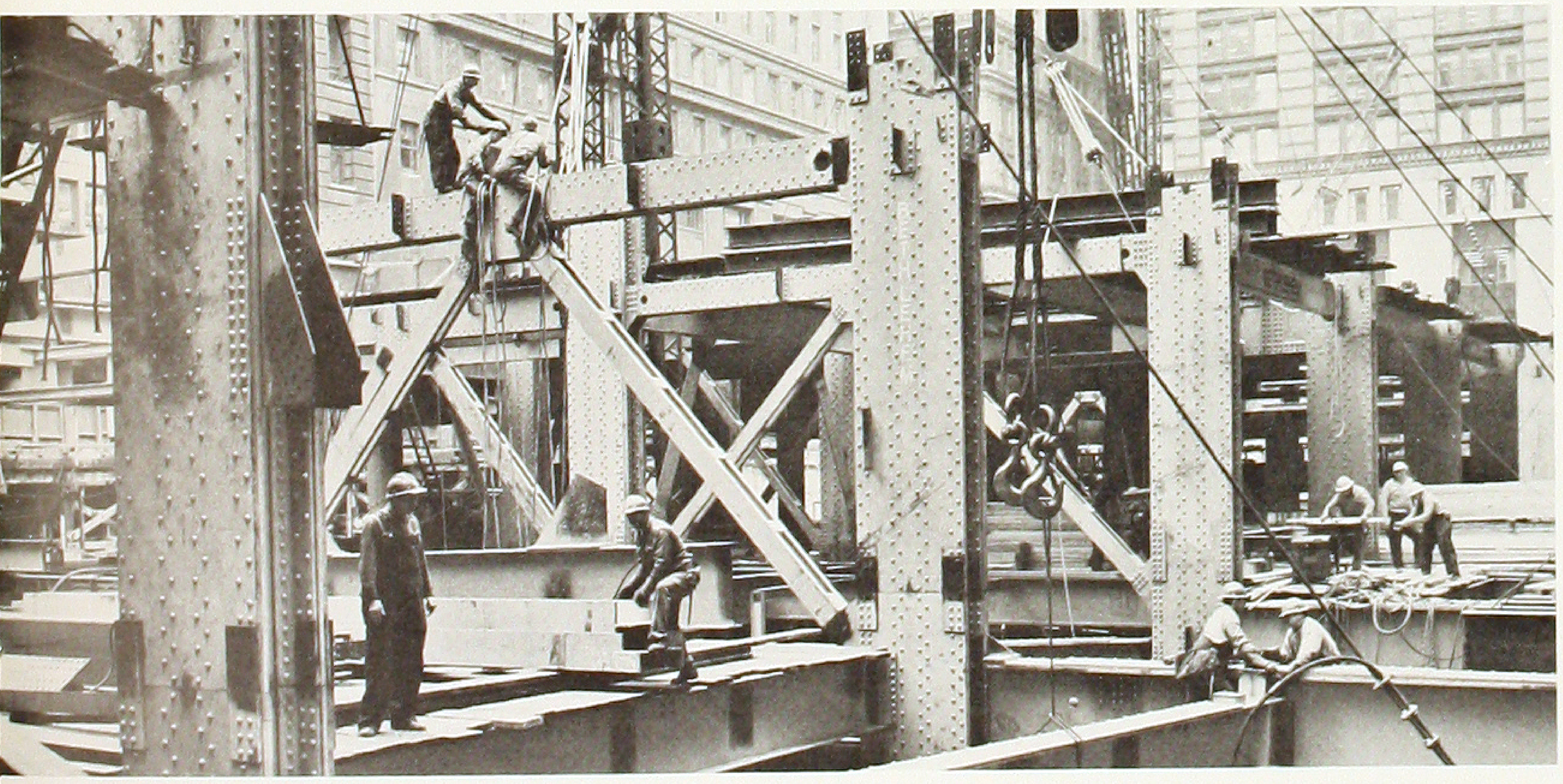


The plaza floor, with its towering arcade, is elevated 17 ft above street level on the Liberty Street side. Here mighty columns dwarf the workmen.



Ease it down! One of the big column sections settles into place. These skillful "raising gangs" work smoothly, make a tough job seem easy.

All together, men! Rigging and jumping a guy derrick calls for teamwork that's reminiscent of duty on an old-time sailing vessel. In fact, many a high-steel man is a former seaman.



Portrait of a busy place. The numerous operations going on here indicate why fully 100 men were needed to erect the steelwork. A project like this requires meticulous planning, careful coordination, and constant emphasis on safety.

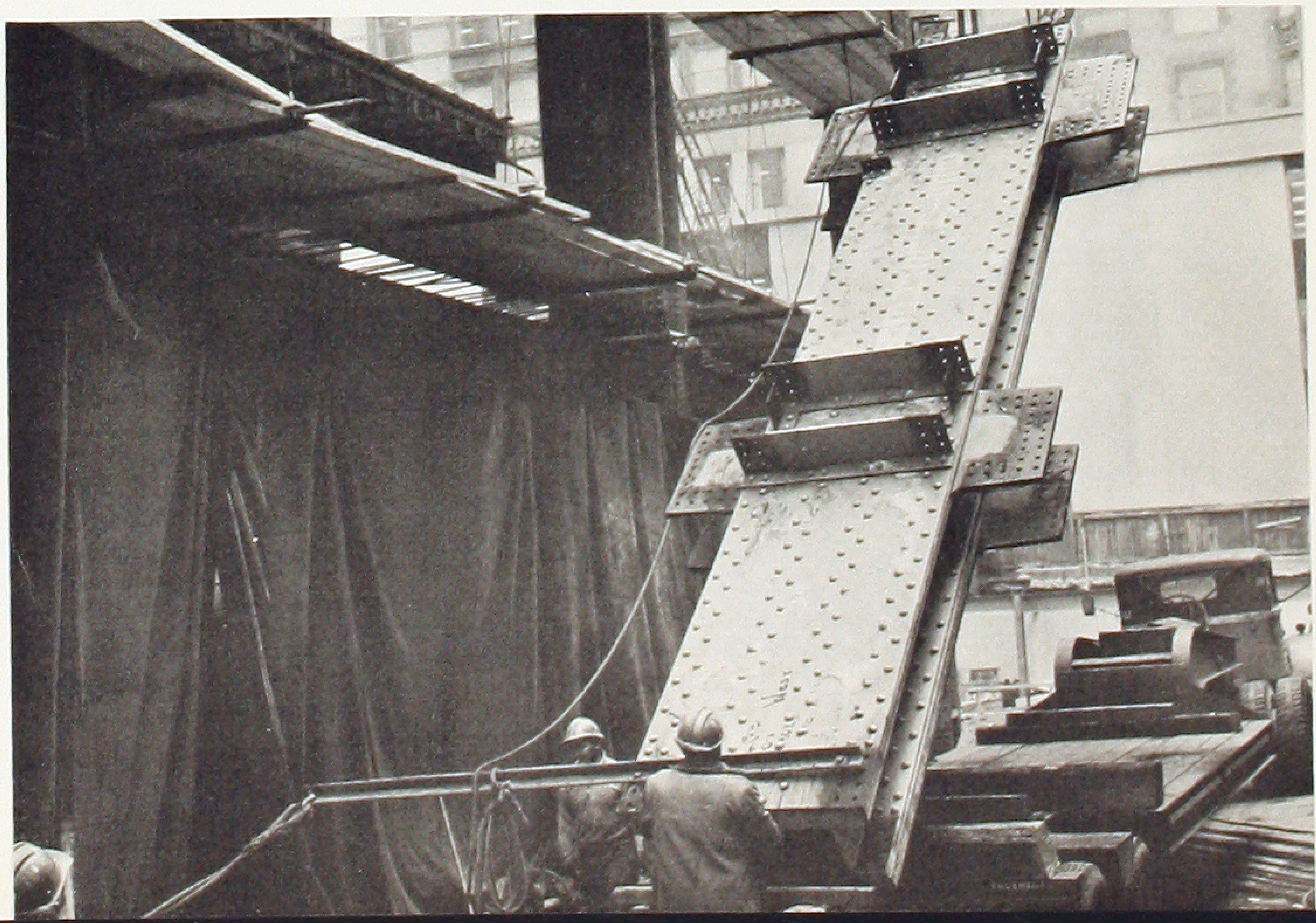
◀ Paper work goes on, too. The bolting gang foreman (right) specifies the proper size bolts to be used, while workers hoist a platform which will furnish safe footing.

Bolting crews followed the raising gangs. The bolts are tightened with a pneumatic impact wrench. Far faster and quieter than riveting, bolting also makes tighter joints. The total number of bolts installed—639,611!

The workman directs the derrick operator from one of the "wind" girders that extend across the office areas from the interior to the exterior columns. The loadings on these girders required that they be of unusually heavy construction. They are actually two pieces, joined together after being placed. The reinforced openings allow the passage of ductwork.

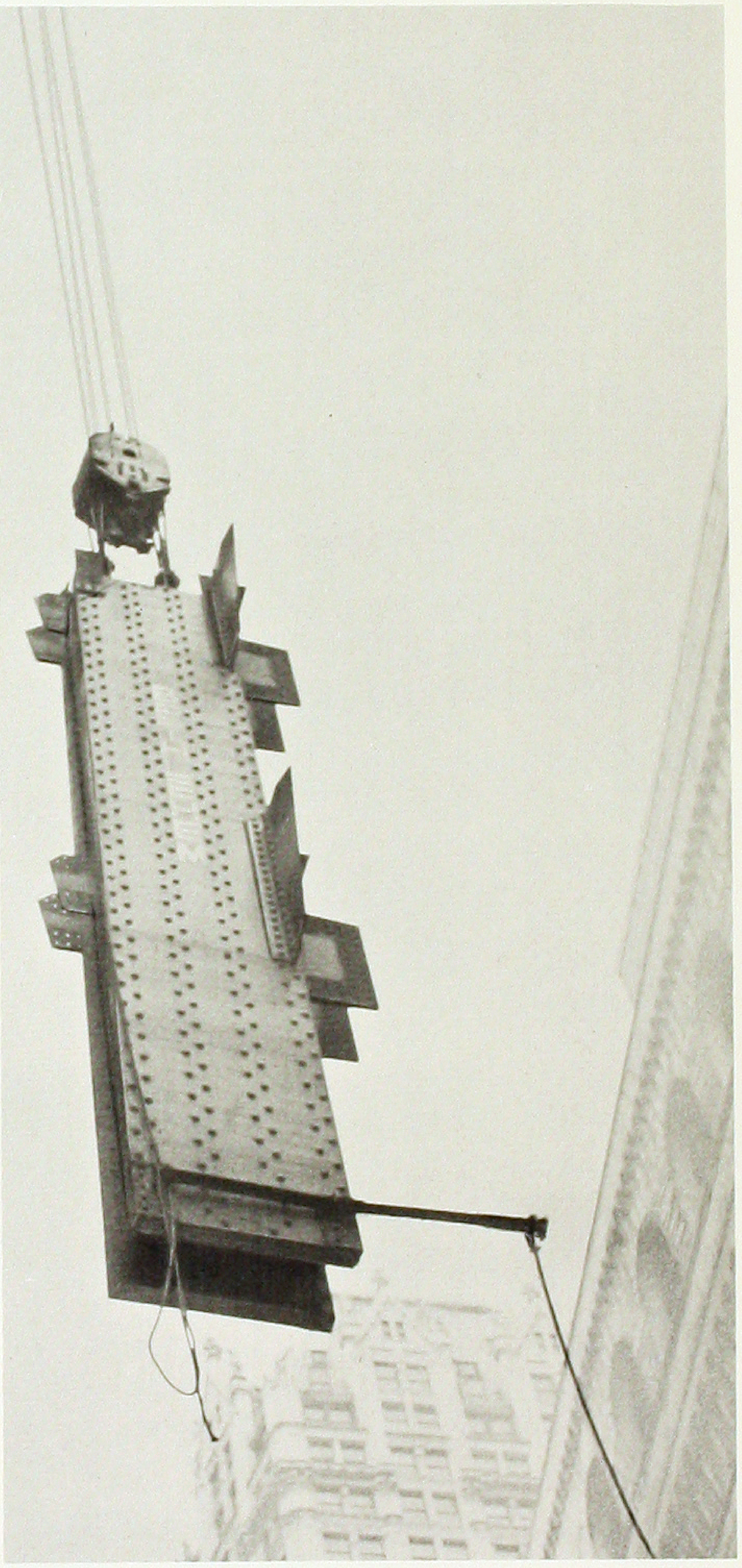
Up-ending a column section from a trailer.

Here an ironworker is driving a drift pin to secure a column which was just erected. Later the pin will be replaced with a high-strength bolt.



The steelwork rises amidst the spires of lower Manhattan. The simple elegance of the completed building will stand in vivid contrast to many of its ornate neighbors.

More than 3,000 kegs of bolts and washers were delivered to the job from our Lebanon, Pa., fastener plant. With storage space limited at the job site, these bolts had to be delivered right on schedule.

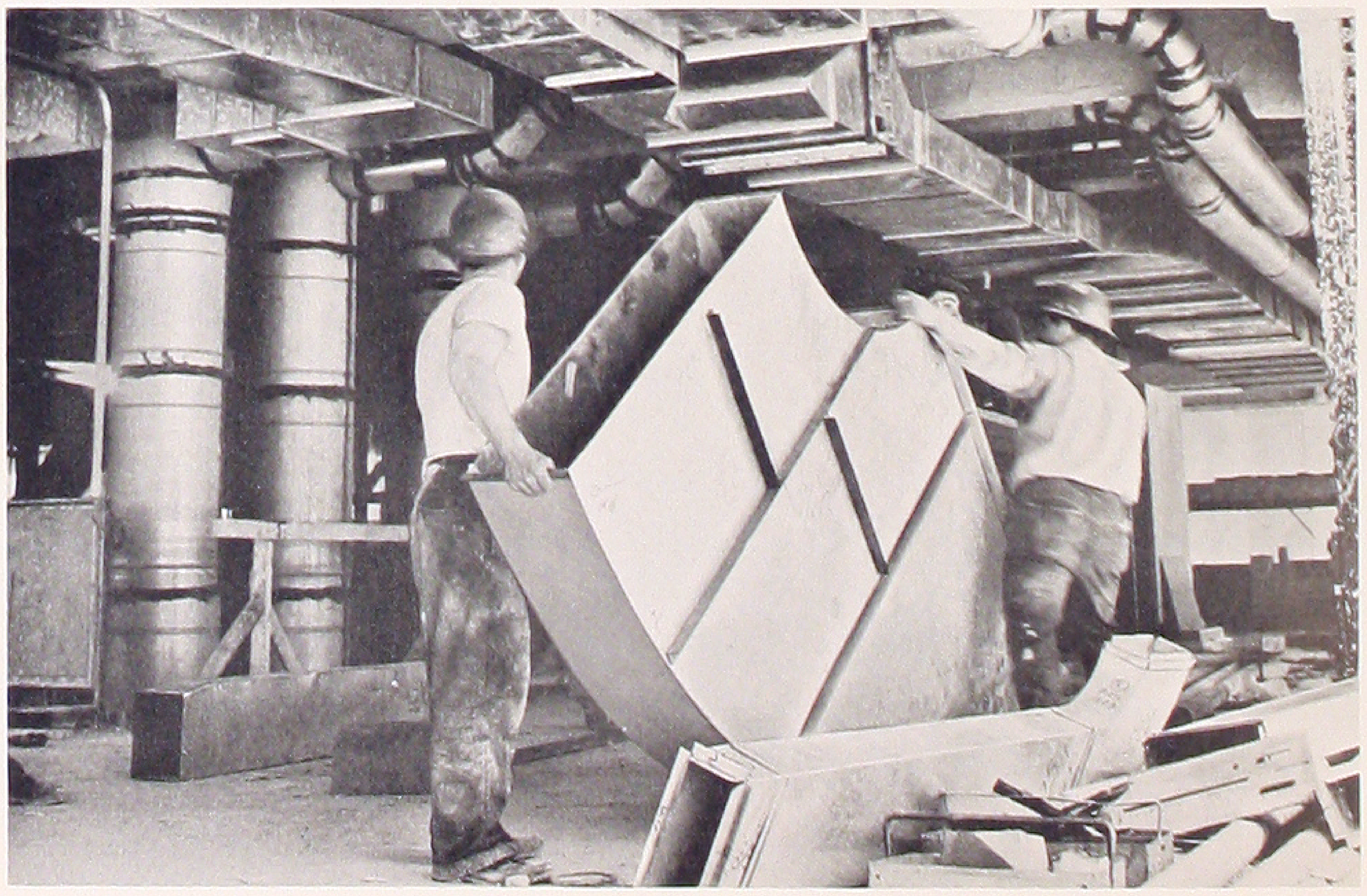


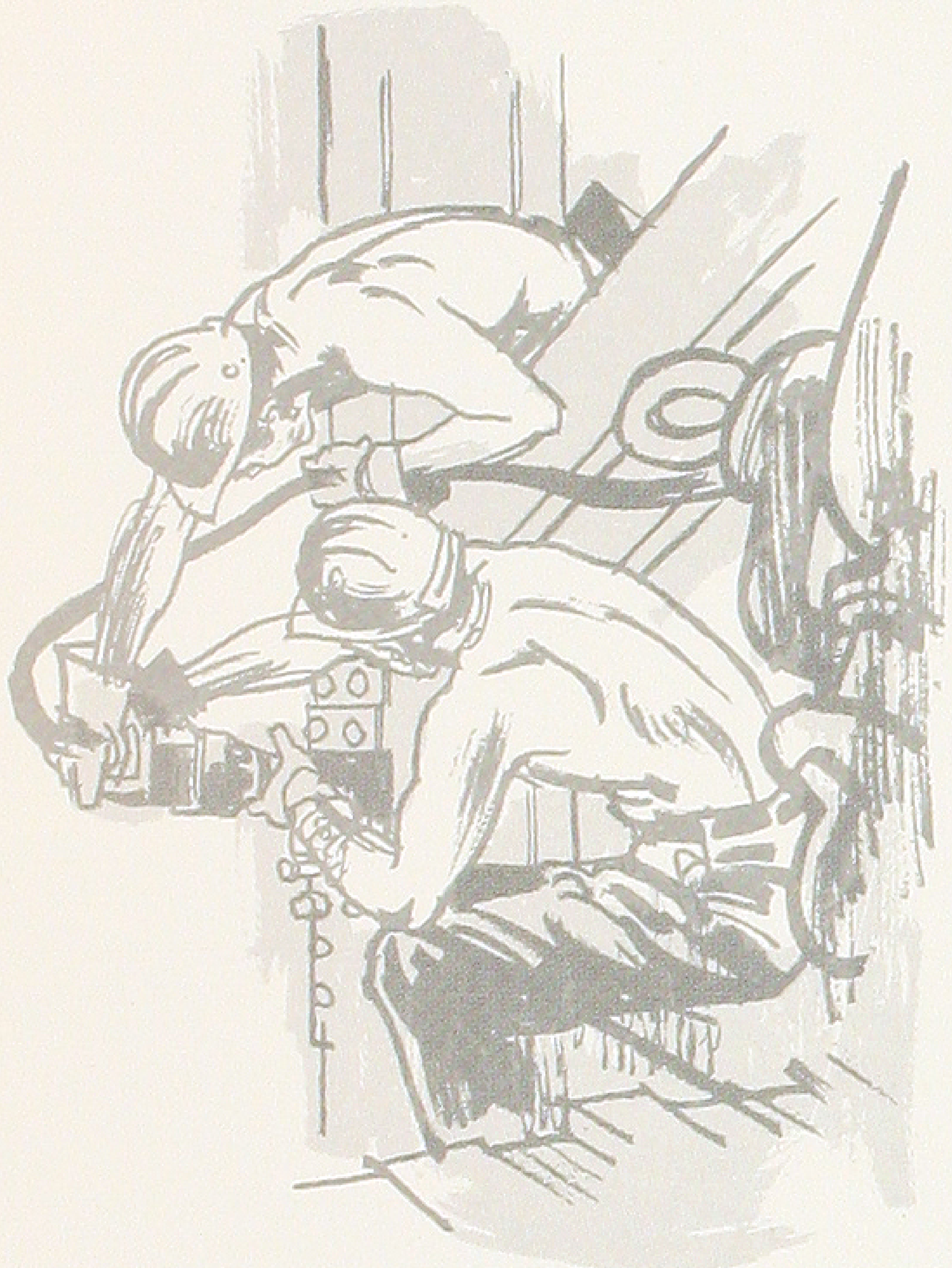
A column section is raised aloft by a powerful derrick. A "tag line" enables a man on the ground to prevent the load from rotating on its way up.

The connections of wind girders to the columns were further strengthened by welding 8-ft-long plates to the columns and to the upper flanges of the girders.

To the eye of a telescopic lens, the high-up steelwork suggested a forest of rivet-studded steel trees.

Both spiral conduits and conventional ductwork were used in the 9,000-ton air-conditioning system — the largest ever installed in a commercial office building. They're made from Bethcon —Bethlehem's top-quality continuously galvanized steel sheets.





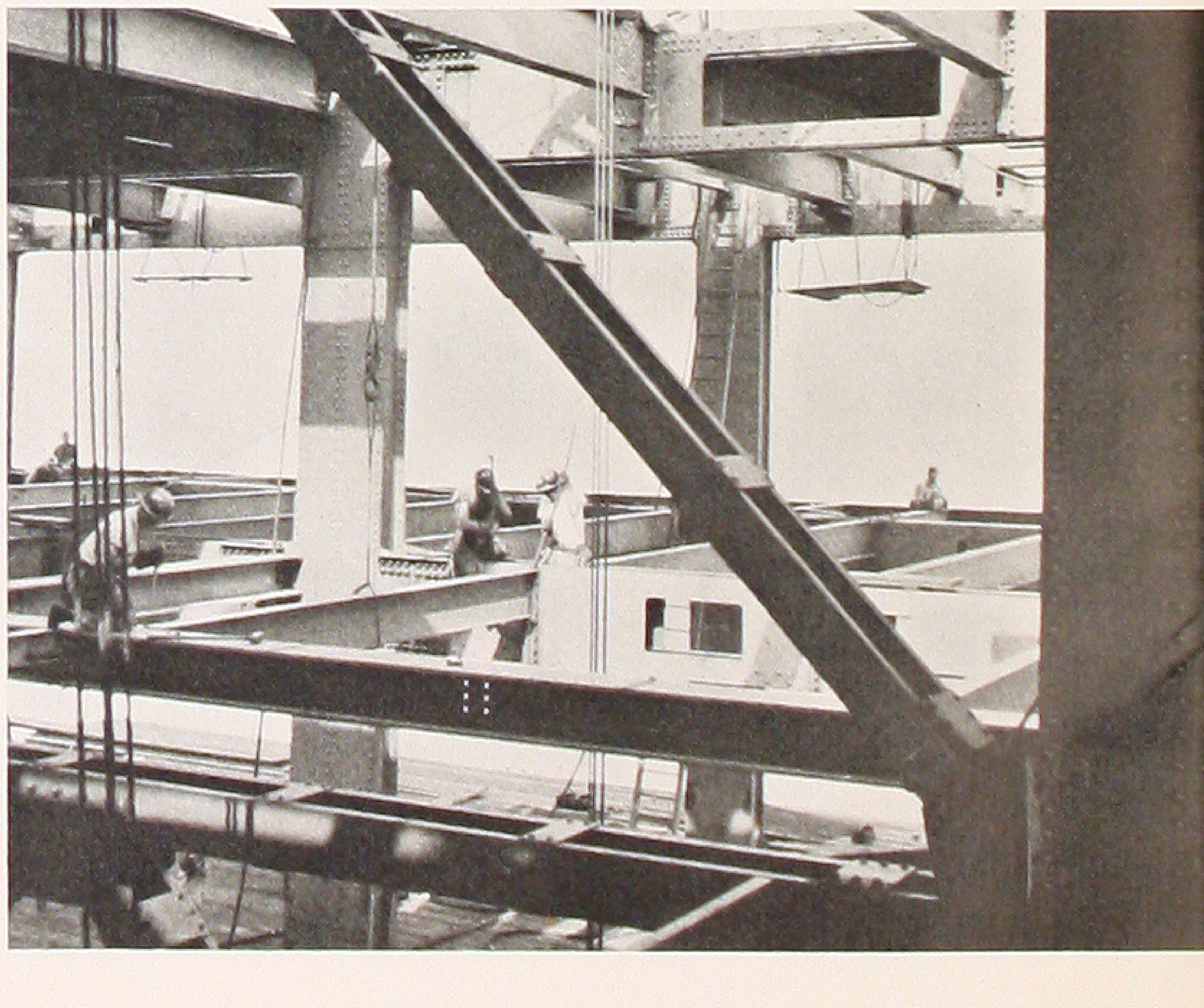
Some 1,500 tons of Bethlehem steel pipe were used in the heating and air-conditioning system.

Cellular steel decking, laid directly on the steel floor beams, was welded firmly in place, then topped with concrete. Since wiring for electrical outlets and telephone connections runs through the steel cells, office arrangements can be planned and altered as desired.

The Chase Manhattan Building represents probably the "largest-ever" installation of steel decking. The speed and ease of laying the steel panels in place permitted the contractor to follow closely behind the steel erection crews.

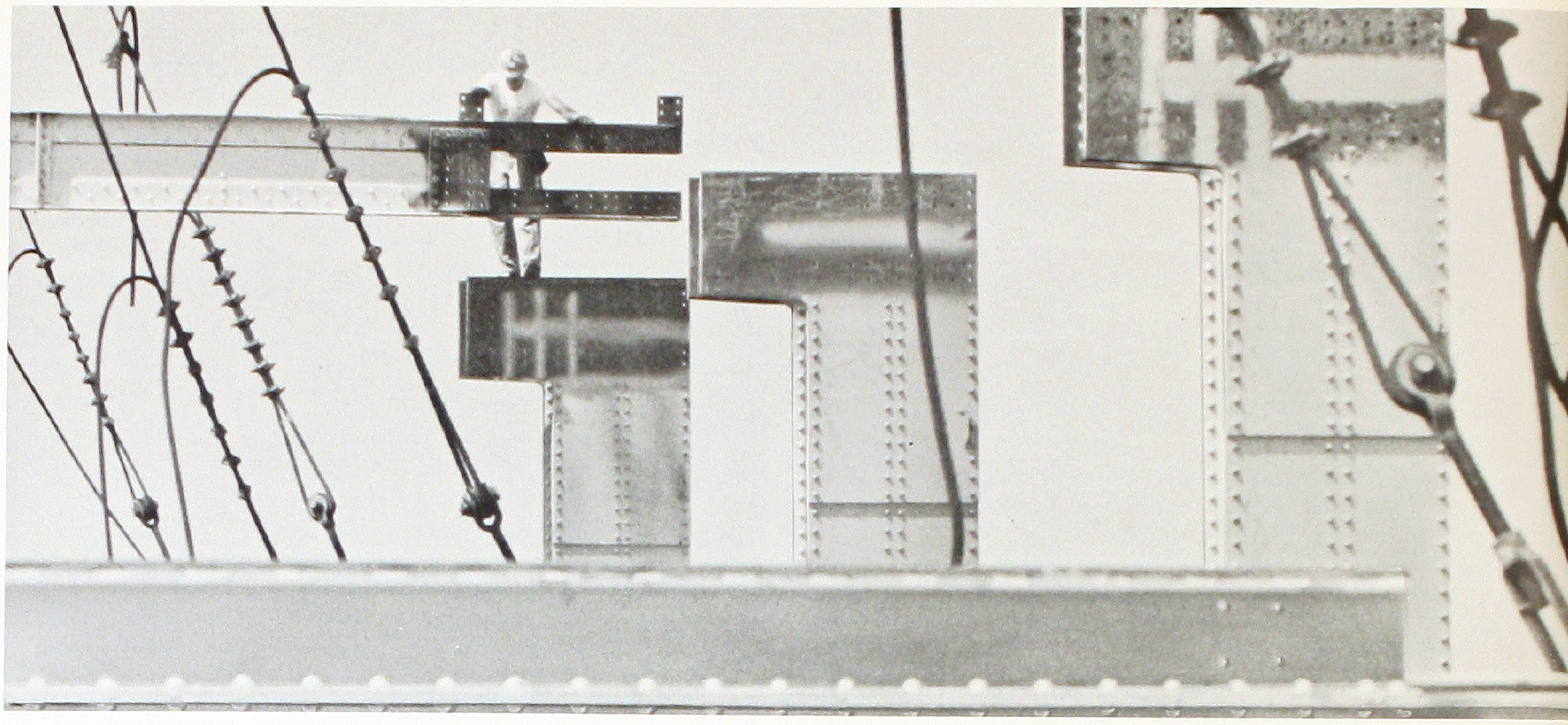
This signalman's sound-powered phone set is for talking with the men sending steel up from the ground, more than 800 ft below.

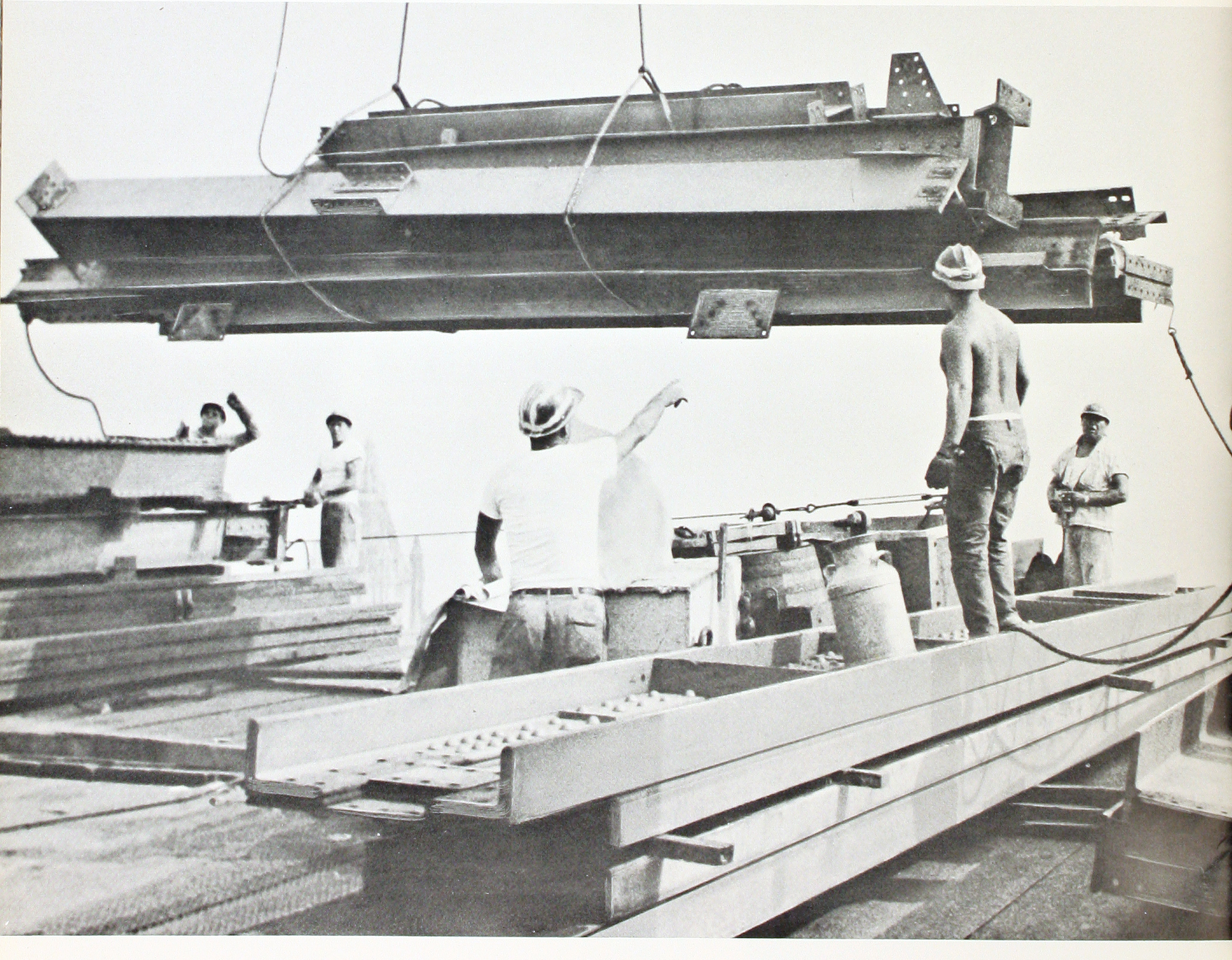
There was plenty of work going on below as the last pieces of steel were placed above the 60th floor.



BETHLEHEM STEEL

This is how the building looked
with eight office floors to go.





Guy wires, columns, and girders pattern the sky with steel as one of the topmost wind girders is connected to the head of a column.

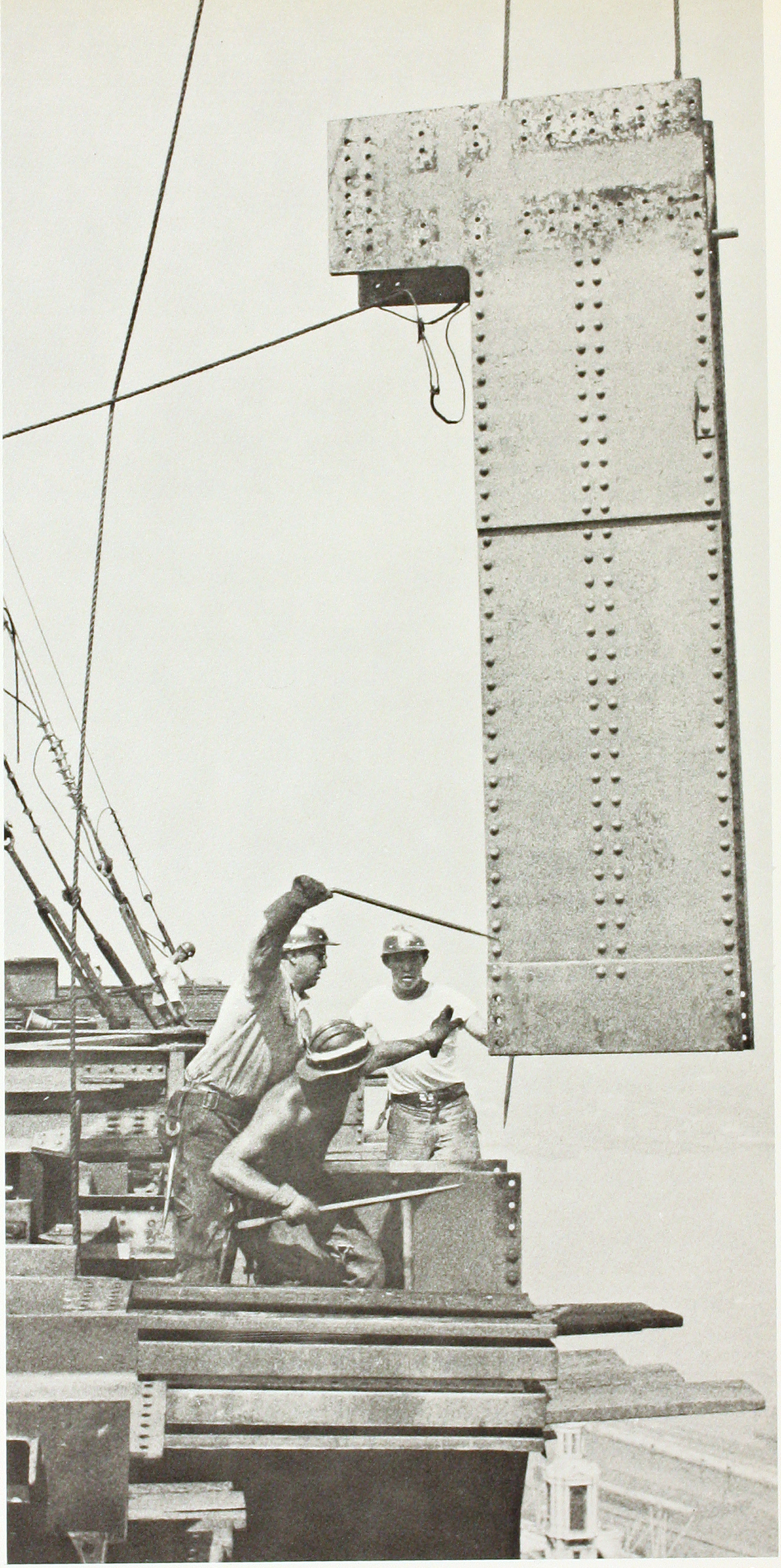
Sometimes there's only one way to get up there. A connector "skins" a column.

The beams and girders were delivered to the derrick floors in bundles, and there sorted and distributed before erection. Only the column sections, too large for storing, were hoisted from the street directly into their final positions.

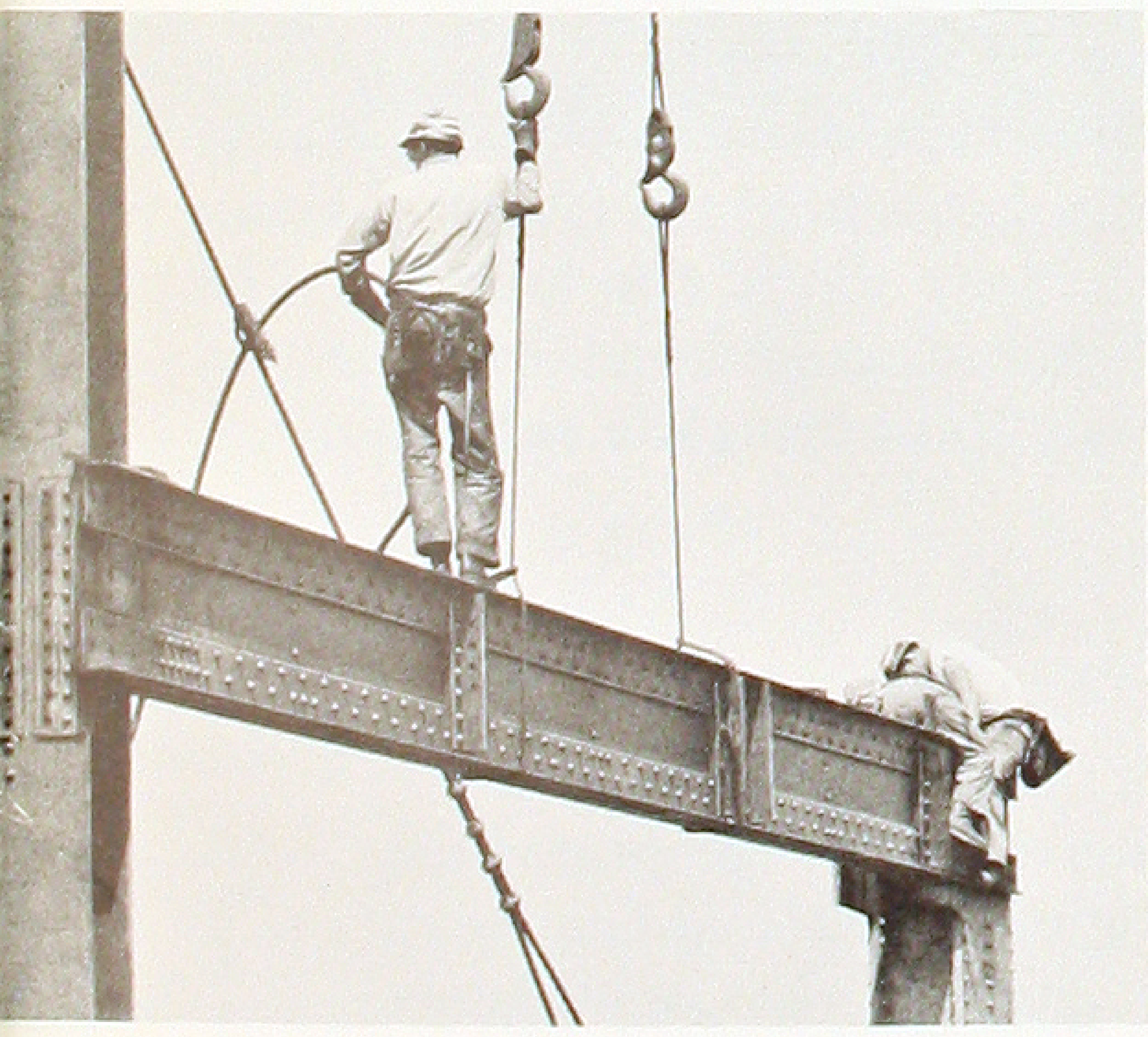
A high-level conference between an engineer and a foreman. Those are bolt baskets at right.

Guiding a wind girder into position.

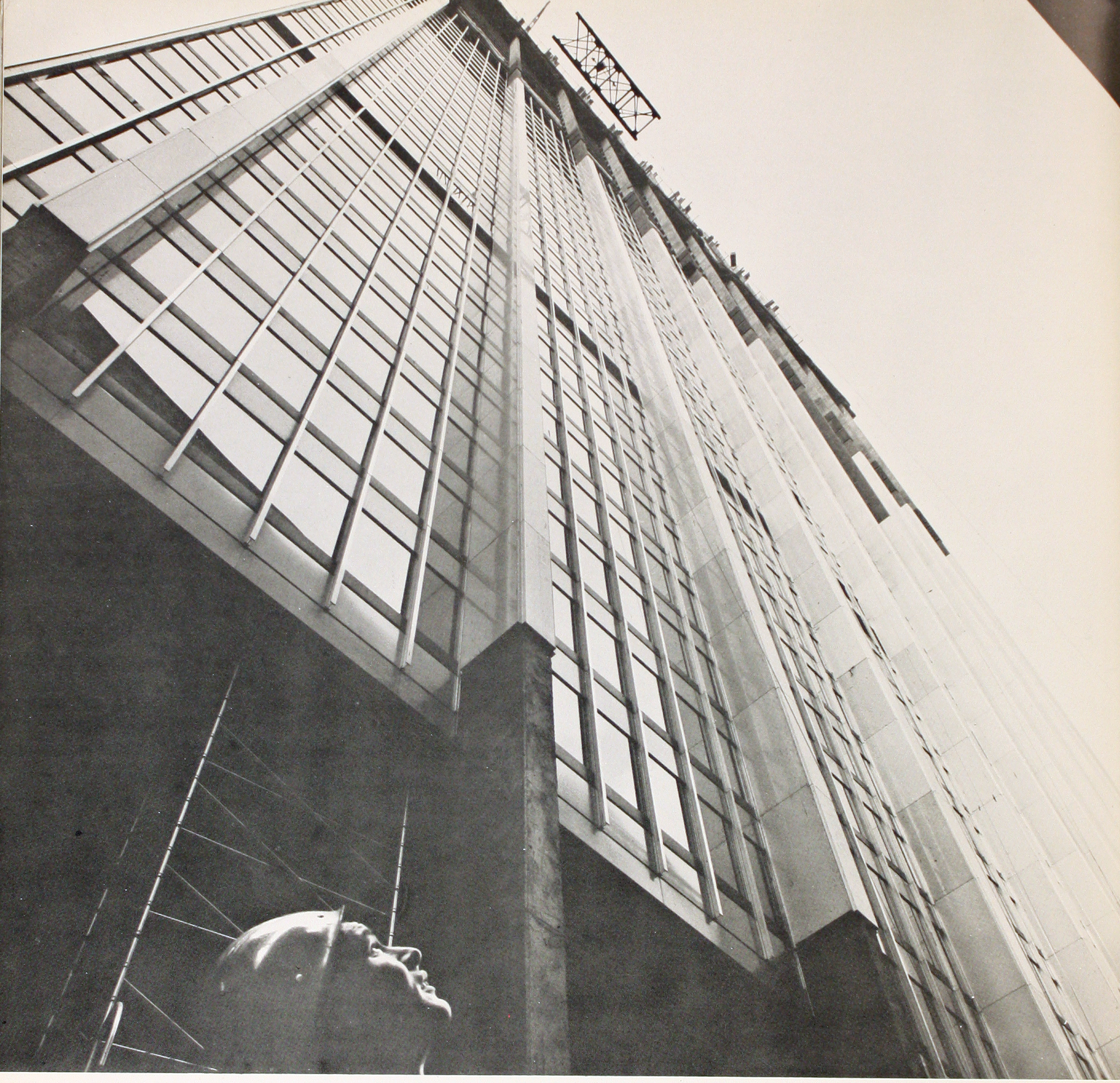
A bolt foreman "out on a limb."



The raising gang plays it safe as the top section of a column is swung into place. Beyond is the Hudson River.

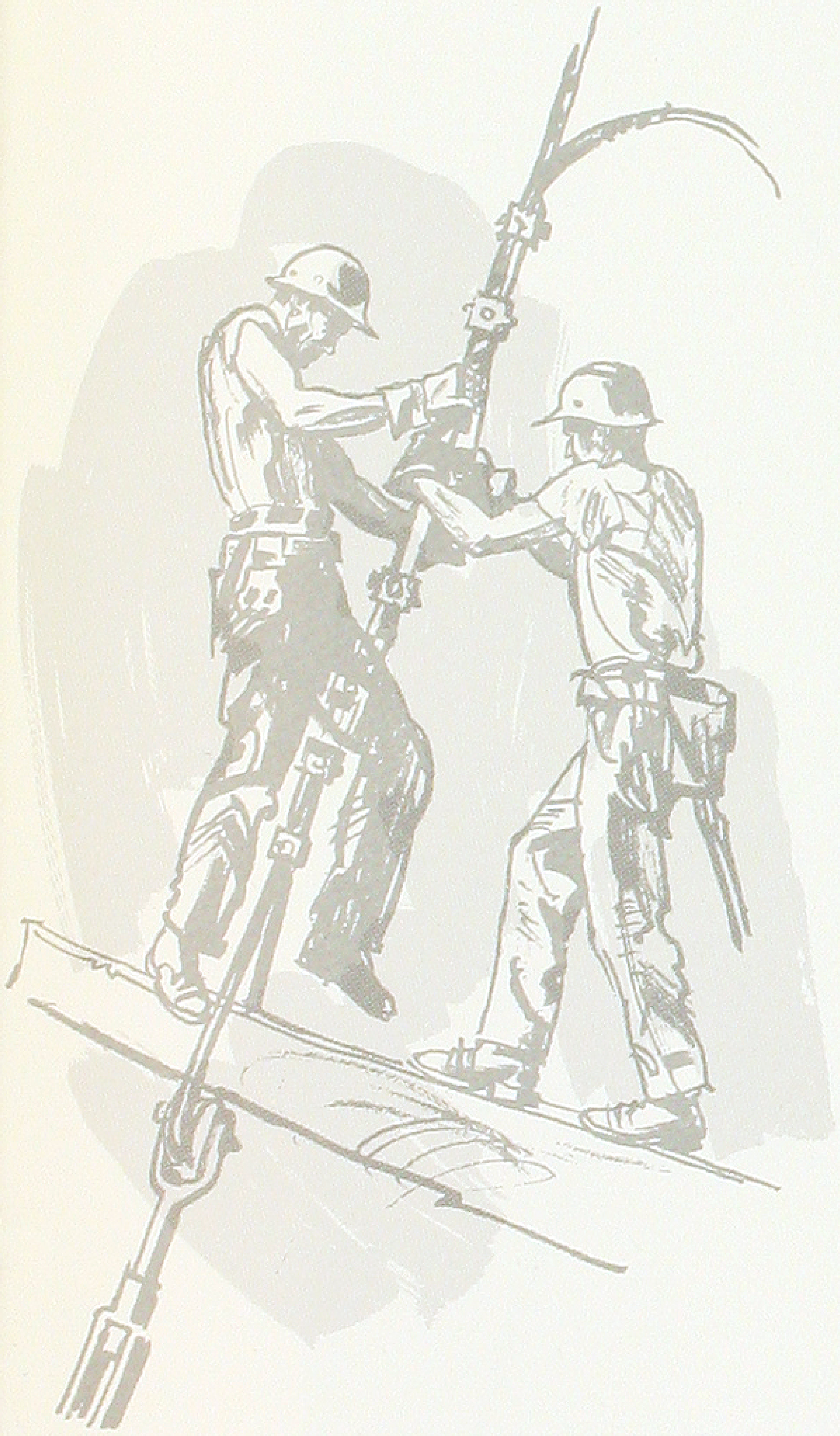


Cool! A connector strikes a casual pose some 800 ft above street level.



Up, up goes one of the last steel members to very top of the building. The handsome glass-and-metal facade was over one-third complete at the time.

A young Mohawk ironworker celebrated the topping out by donning his tribal headgear. Less spectacular, perhaps, but a lot more practical, is the distinctive three-ribbed Bethlehem Steel hard hat in his hand.



One of the most unusual construction photographs ever taken shows ironworkers connecting one of the uppermost members.

BETHLEHEM FABRICATED STEEL CONSTRUCTION

Fabricating Works:

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LEETSDALE, PA.
STEELTON, PA.
JOHNSTOWN, PA.
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BEAUMONT, TEX.
SOUTH SAN FRANCISCO, CALIF.
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TORRANCE, CALIF.
SEATTLE, WASH.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

PACIFIC COAST DIVISION
General Offices: San Francisco

Export Distributor: BETHLEHEM STEEL EXPORT CORPORATION

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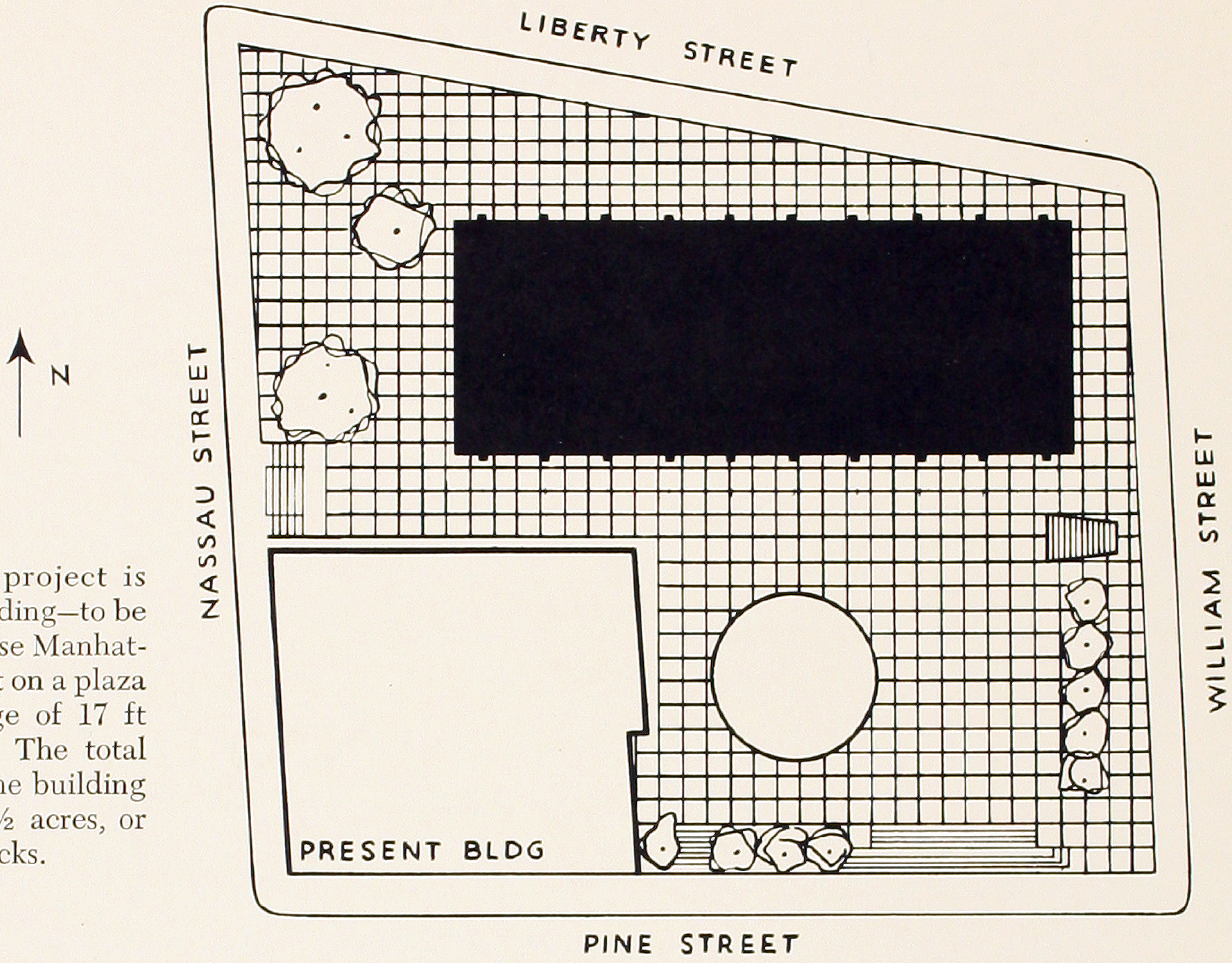

When the entire project is completed, the building—to be known as No. 1 Chase Manhattan Plaza—will front on a plaza elevated an average of 17 ft above street level. The total area occupied by the building and the plaza is 2½ acres, or nearly two city blocks.

Designers and Engineers:
- *Architects:* Skidmore, Owings & Merrill
- *Consulting foundation engineers:* Moran, Proctor, Mueser & Rutledge
- *Consulting structural engineers:* Weiskopf & Pickworth
- *Consulting mechanical engineers:* Jaros, Baum & Bolles
- *Consulting electrical engineers:* Meyer, Strong & Jones

Contractors:
- *General contractor:* Turner Construction Company
- *Foundation contractors:* The Foundation Company; George M. Brewster & Son, Inc.; Joseph Miele Construction Company, Inc.
- *Heating and air-conditioning contractors:* Raisler Corp. and Kerby Saunders, Inc., a joint venture